Supreme Court, U.S.
FILED

941631 APR 4 - 1995

OFFICE OF THE CLERK

No. 94-

IN THE
Supreme Court of the United States
OCTOBER TERM, 1994

STATE OF OKLAHOMA,

Petitioner,

v.

CITY OF NEW YORK, *et al.*,

Respondents.

On Petition for a Writ of Certiorari to the United States Court of Appeals for the Second Circuit

APPENDIX TO PETITION FOR A WRIT OF CERTIORARI

ROBERT D. NELON
Counsel of Record
DON G. HOLLADAY
ANDREWS DAVIS LEGG BIXLER
MILSTEN & PRICE
500 West Main
Oklahoma City, Oklahoma 73102
(405) 272-9241

Attorneys for Petitioner

April 4, 1995

PRESS OF BYRON S. ADAMS, WASHINGTON, D.C. 1-800-347-8208

APPENDIX

TABLE OF CONTENTS

Document	Page
DECISION, United States Court of Appeals for the Second Circuit, dated August 8, 1994 (*City of New York v. U.S. Dept. of Commerce*, 34 F.3d 1114 (2nd Cir. 1994))	A-1
MEMORANDUM AND ORDER, United States District Court for the Eastern District of New York, dated April 13, 1993 (*City of New York v. U.S. Dept. of Commerce*, 822 F.Supp. 906 (E.D.N.Y. 1993))	A-46
MEMORANDUM AND ORDER, United States District Court for the Eastern District of New York, dated June 7, 1990 (*City of New York v. U.S. Dept. of Commerce*, 739 F.Supp. 761 (E.D.N.Y. 1990))	A-104
MEMORANDUM AND ORDER, United States District Court for the Eastern District of New York, dated April 21, 1989 (*City of New York v. U.S. Dept. of Commerce*, 713 F.Supp. 48 (E.D.N.Y. 1989))	A-130
NOTICE OF FINAL DECISION, U.S. Department of Commerce, Office of the Secretary, Decision on Whether a Statistical Adjustment of the 1990	

Census of Population and Housing Should Be Made for Coverage Deficiencies Resulting in an Overcount or Undercount of the Population, dated July 15, 1991 (56 Fed. Reg. 33,582 (July 22, 1991)) A-146

ORDER, United States Court of Appeals for the Second Circuit, dated January 4, 1995 . . . . . A-449

ORDER, United States Court of Appeals for the Second Circuit, dated December 12, 1994 . . . . . A-453

UNITED STATES COURT OF APPEALS

FOR THE SECOND CIRCUIT

No. 813---August Term, 1993

(Argued: January 5, 1994 Decided: August 8, 1994)

Docket No. 93-6183

CITY OF NEW YORK; STATE OF NEW YORK; CITY OF LOS ANGELES; CITY OF CHICAGO; CITY OF HOUSTON; DADE COUNTY, FLORIDA; UNITED STATES CONFERENCE OF MAYORS; NATIONAL LEAGUE OF CITIES; LEAGUE OF UNITED LATIN AMERICAN CITIZENS; NATIONAL ASSOCIATION FOR THE ADVANCEMENT OF COLORED PEOPLE; MARCELLA MAXWELL; DONALD H. ELLIOTT; JOHN MACK; OLGA MORALES; TIMOTHY W. WRIGHT, III; RAYMOND G. ROMERO; ANTONIO GONZALES; ATHALIE RANGE; JERRY ALAN WOOD; CAROLYN SUE LOPEZ; CITY OF ATLANTA, GEORGIA; MAYNARD JACKSON, Individually, and as the Mayor of the City of Atlanta; FLORIDA HOUSE OF REPRESENTATIVES; FLORIDA STATE CONFERENCE; MIGUEL A. DE GRANDY; WILLYE DENNIS; MARIO DIAZ-BALART; DR. CHARLES EVANS; RODOLFO GARCIA, JR.; BOLLOWY L. "BO" JOHNSON; ALFRED J. LAWSON, JR.; WILLIS LOGAN, JR.; JOHNNIE

MCMILLAN; ALZO J. REDDICK; PETER RUDY WALLACE; T.K. WETHERELL,

Plaintiffs-Appellants,

STATE OF TEXAS; CITY OF PHOENIX, ARIZONA; STATE OF NEW JERSEY; STATE OF FLORIDA; CITY OF CLEVELAND, OHIO; CITY OF DENVER, COLORADO; CITY OF INGLEWOOD, CALIFORNIA; CITY OF NEW ORLEANS, LOUISIANA; CITY OF OAKLAND, CALIFORNIA; CITY OF PASADENA, CALIFORNIA; CITY OF PHILADELPHIA, PENNSYLVANIA; CITY OF SAN ANTONIO, TEXAS; CITY OF SAN FRANCISCO, CALIFORNIA; BROWARD COUNTY, FLORIDA; STATE OF ARIZONA; CITY OF BALTIMORE, MARYLAND; CITY OF BOSTON, MASSACHUSETTS; CITY OF LONG BEACH, CALIFORNIA; CITY OF SAN JOSE, CALIFORNIA; LOS ANGELES COUNTY, CALIFORNIA; SAN BERNADINO COUNTY, CALIFORNIA; DISTRICT OF COLUMBIA; NAVAJO NATION; STATE OF NEW MEXICO; CITY OF TUCSON, ARIZONA; COUNCIL OF GREAT CITY SCHOOLS,

Intervenors-Plaintiffs-Appellants,

PEOPLE OF THE STATE OF CALIFORNIA EX REL DANIEL E. LUNGREN, ATTORNEY GENERAL,

Plaintiff,

COUNTY OF HUDSON, NEW JERSEY,

Intervenor-Plaintiff,

--v.--

UNITED STATES DEPARTMENT OF COMMERCE; RONALD H. BROWN, ESQ. As Secretary of the United States Department of Commerce; MICHAEL R. DARBY, As Under Secretary for Economic Affairs of the United States Department of Commerce; Bureau of Census; BARBARA EVERITT BRYANT, As Director of Bureau of Census; WILLIAM J. CLINTON, As President of the United States; DONALD K. ANDERSON, As Clerk of the United States House of Representatives; MICHAEL ESPY, As Secretary of Agriculture; DONNA E. SHALALA, As Secretary of Health & Human Services; HENRY CISNEROS, As Secretary of Housing & Urban Development; ROBERT B. REICH, As Secretary of Labor; FREDERICO PENA, As Secretary of Transportation; RICHARD W. RILEY, As Secretary of Education,

Defendants-Appellees,

STATE OF WISCONSIN; STATE OF OKLAHOMA,

Intervenors-Defendants-
Appellees.

Before: TIMBERS, KEARSE, and LEVAL, Circuit Judges.

KEARSE, Circuit Judge:

Plaintiffs City of New York *et al.* appeal from a judgment entered in the United States District Court for the Eastern District of New York following a bench trial before Joseph M. McLaughlin, *Judge*,* dismissing their action to compel defendants United States Department of Commerce ("DOC") *et al.* (collectively the "federal defendants") to make statistically-based adjustments to the 1990 United States census in order to rectify acknowledged undercounting of certain minority groups, including African-Americans, Hispanics, Asian-Pacific Islanders, and Native Americans. The district court, applying a standard of review set out in the Administrative Procedure Act, 5 U.S.C. § 706 (1988) ("APA"), *see* 713 F.Supp. 48, 54 (1989), dismissed the complaint on the ground that the decision of the Secretary of Commerce (the "Secretary") not to adjust the census figures was not arbitrary or capricious. *See* 822 F.Supp. 906 (1993). On appeal, plaintiffs contend that, because the constitutional right to equal apportionment of votes depends on having the most accurate census practicable, the district court should not have applied an arbitrary-and-capricious standard of review but should have reviewed the Secretary's decision *de novo*. In opposition, the federal defendants argue that the Secretary's decision not to make a statistical adjustment to the census was entirely immune from judicial review or, at the most, was reviewable only for reasonableness, and that the district court correctly found

---

*Honorable Joseph M. McLaughlin, of the United States Court of Appeals for the Second Circuit, sitting by designation. When the case was initiated, Judge McLaughlin was a Direct Judge in the Eastern District; he became a Circuit Judge in 1990.

that the decision not to adjust was not unreasonable. The States of Wisconsin and Oklahoma, as intervenors-defendants-appellees, argue that the district court's decision should be affirmed on the ground that the Census Act, 13 U.S.C. § 131 *et seq.* (1988), prohibits any statistical adjustment of a census that is used for congressional apportionment.

For the reasons stated below, we conclude that the district court properly held that the Secretary's decision is reviewable and that the Census Act does not prohibit a statistical adjustment of the initial census enumeration; but we conclude that the court should not have reviewed the Secretary's decision under the APA's arbitrary-and-capricious standard of review. We vacate and remand for the court to determine whether the Secretary's decision not to make an adjustment in order to improve the overall count and reduce the disproportionate undercounting of minority groups was essential to the achievement of a legitimate governmental interest.

I. BACKGROUND

The background of this litigation focusing on the 1990 census has been painstakingly explored by the district court in several published opinions, *see City of New York v. United States Department of Commerce*, 713 F.Supp. 48 (E.D.N.Y.1989) ("*NYC v. DOC I*"); *City of New York v. United States Department of Commerce*, 739 F.Supp. 761 (E.D.N.Y.1990) ("*NYC v. DOC II*"); *City of New York v. United States Department of Commerce*, 822 F.Supp. 906 (E.D.N.Y.1993) ("*NYC v. DOC III*"), familiarity with which is assumed. The following description is taken largely from

NYC v. DOC III, which includes the district court's findings after trial.

A. *The Constitutional Requirement of a Decennial Census*

The Constitution of the United States requires a decennial census of the population. *See* Art. I, § 2, cl. 3 (an "actual Enumeration shall be made ... within every ... Term of ten Years"). The Constitution provides that members of the House of Representatives shall be apportioned among the states "according to their respective Numbers." Art. I, § 2, cl. 3; *see also* 14th Amend. § 2 ("Representatives shall be apportioned among the several States according to their respective numbers, counting the whole number of persons in each State...."). The apportionment of Representatives among the states also determines the allocation of votes to the states for the election of the President. *See* Art. II. § 1, cl. 2 ("Each State shall appoint ... a Number of Electors, equal to the whole Number of Senators and Representatives to which the State may be entitled in the Congress....").

In addition to these federal constitutional purposes, the census data are used by the states to draw boundaries for congressional and state legislative districts and are used by local governments to establish districts for other representative bodies such as county legislatures, city councils, and boards of supervisors. Census data are also used to allocate federal and state funding and services. For purposes other than apportionment, Congress has directed that, in addition to the decennial census, there be a mid-decade census. *See* 13 U.S.C. § 141(d).

The Constitution provides that the decennial census shall be conducted "in such Manner as [Congress] shall by

Law direct." Art. I, § 2, cl. 3. The agency designated by Congress to conduct the census is the Bureau of the Census ("Bureau" or "Census Bureau"), an agency within DOC. *See* 13 U.S.C. § 2 (1988).

B. *The Census Bureau's Planned Statistical Adjustment*

Each decennial census has inevitably contained errors, resulting from, *inter alia*, the failures of millions of United States residents to return census forms or be counted by other means, leading to omissions, and the multiple counting of some residents and the listing of nonexistent persons, leading to overcounting. The census thus provides at best only an estimate of the nation's true population. Further, the census has been found to undercount members of ethnic and racial minority groups more severely than members of other demographic groups. This phenomenon, known as the "differential undercount," has skewed every census since at least 1940. The Census Bureau started measuring the differential undercount in that year.

In preparation for the 1980 census, the Bureau hoped that a combination of outreach efforts and attempts to focus energies on improving the count in areas such as inner cities, where the undercount was particularly great, would lead to a reduction of both the overall undercount and the differential undercount. When those efforts failed, the Bureau decided to create a program for the 1990 census that would address the problem though other techniques. By 1984, the Bureau had developed an internal research plan to aid it in deciding whether or not the 1990 census should be statistically adjusted in order to reduce the differential undercount. The Bureau created an Undercount Steering Committee and an Undercount Research Staff to consider the

undercount problem and sought advice from outside experts and organizations such as the American Statistical Association and the National Academy of Science. The Bureau also consulted state and local governments, planned an extensive advertising campaign, designed a more ethnically inclusive census questionnaire, and developed an automated geographical control system to help assure accurate and timely maps and geographic files for the 1990 census.

Based on recommendations of the Undercount Steering Committee, the Undercount Research Staff, and other experts, the Bureau determined that the best tool for adjusting the census would be a "post-enumeration survey" ("PES"). Using a "dual system elimination," also known as "capture/recapture," the original enumeration would be followed by a second measurement, the PES, which would attempt to measure the rate at which people were omitted or erroneously enumerated by the census, in order to determine the net undercount rate. The net undercount rate would indicate the appropriate amount by which the census should be adjusted.

Although the Bureau had used a PES in a number of ways since 1950, it had never used dual system elimination to make a statistical adjustment to a decennial census. The Bureau worked throughout most of the 1980s to hone the PES into an effective tool for census adjustment. For example, an adjustment problem can occur when individuals who have different probabilities of being counted are placed in a single category. This problem was to be reduced by the use of "poststratification," a technique in which highly specific categories are created and all individuals with a similar likelihood of being counted are placed in a specific

category. These categories, or "poststrata," were defined by age, sex, race, Hispanic origin, housing tenure, type of environment (*e.g.*, urban or rural), and geographic region. This categorization resulted in a total of 1,392 exhaustive and mutually-exclusive poststrata. In addition, anomalous results in the PES were to be addressed by statistical "smoothing," a procedure designed to minimize the effects of sampling error by reducing the difference between the results produced by PES sampling and the results that would be obtained if one were able to survey the entire population.

C. *DOC's 1987 Decision, NYC v. DOC I, and the 1989 Stipulation*

By May 1987, the Census Bureau had determined that an adjustment of the 1990 census using a postenumeration survey would be feasible and that the Bureau would undertake to conduct a full-fledged PES in order to be able to correct the census. High-ranking DOC officials, however, promptly decided against any adjustment in the 1990 census, though they instructed Bureau officials not to disclose that decision publicly. On October 30, 1987, DOC publicly announced its decision that the 1990 census would not be statistically adjusted.

The present action was commenced in 1988 by plaintiffs including the cities of New York, Los Angeles, and Chicago, the States of New York and California, Dade County, Florida, the National League of Cities, the League of United Latin American Citizens, the National Association for the Advancement of Colored People, and numerous individuals. The original plaintiffs were eventually joined by intervening plaintiffs that included more than a dozen other cities, the States of Texas, New Jersey, Florida, Arizona,

New Mexico, and the Navajo Nation. Plaintiffs contended that the Secretary's announced decision not to adjust the 1990 census violated their rights under, *inter alia*, the Fifth Amendment. Complaining principally of an anticipated loss of representation and an anticipated deprivation of funds to be distributed under federal programs based on census figures, plaintiffs challenged the methodology to be used in the 1990 census and sought to enjoin the census unless it would be subject to adjustment.

The federal defendants moved to dismiss the complaint, contending that the Secretary's decision was unreviewable. The district court denied that motion, holding that plaintiffs had standing to challenge the census on constitutional grounds. *NYC v. DOC I*, 713 F.Supp. at 52. The court also ruled that it would review the Secretary's decision against adjustment under the arbitrary-and-capricious standard set out in the APA. *Id.* at 54.

In the wake of these decisions, the parties entered into a stipulation dated July 17, 1989 (the "1989 Stipulation"), pursuant to which plaintiffs would withdraw their motion to enjoin the census and DOC would reconsider, in accordance with specified ground-rules, its 1987 decision not to adjust the 1990 census. The principal premises of the 1989 Stipulation were that

> the Secretary of Commerce is vested by law with supervisory authority over the Bureau of the Census and the conduct of the Decennial Census and does not by anything said herein intend to relinquish any authority or decision-making power thereby duly vested in him, including without limitation the

> decision whether or not to adjust the 1990 Decennial Census;

that

> the Secretary of Commerce intends that the 1990 Decennial Census shall be conducted in conformity with all applicable statutory and constitutional requirements ... and in a manner designed to achieve the most accurate population counts practicable;

and that

> the parties hereto at this time believe that the Census, including a post-enumeration survey and other adjustment-related operations, can and will be conducted in a manner that will result in the most accurate counts practicable, and no party has any basis at this time to believe that the Census, including the PES and adjustment-related operations, cannot and will not be conducted in such a manner.

(1989 Stipulation "Whereas" clauses.)

The agreement called for the vacatur of the Secretary's 1987 decision against adjustment of the 1990 census (1989 Stipulation ¶ 2), and required the federal defendants to

> undertake to conduct a [PES] of not fewer than 150,000 households ... and such other procedures or tests as they deem appropriate, as part of the 1990 Decennial Census in a manner calculated to ensure the possibility of using the PES, not solely for

> evaluation purposes, but to produce corrected counts usable for congressional and legislative reapportionment, redistricting, and all other purposes for which the [Bureau] publishes data,

(*id.* ¶ 3). The Stipulation also required a *de novo* reconsideration by the then-new Secretary Robert Mosbacher, "undertaken with an open mind, without any prejudgment, and consistent with the procedures set forth" in the 1989 Stipulation, on "the question of whether or not to carry out a statistical adjustment of the 1990 Decennial Census." (*Id.* ¶ 2.)

The 1989 Stipulation required that the Secretary's assessment of any proposed adjustment be in accordance with a set of published guidelines (the "Guidelines"), to be promptly developed by DOC, "articulating what defendants believe are the relevant technical and nontechnical statistical and policy grounds for decision on whether to adjust the 1990 Decennial Census population counts." (1989 Stipulation ¶ 4.) DOC was also required to appoint and fund a Special Advisory Panel of statistical and demographic experts ("Advisory Panel") to advise the federal defendants with respect to, *inter alia*,

> the application and achievement of the [G]uidelines, ... and plans and schedules for the implementation of the Census and the PES in a manner that will result in the most accurate final census data at the earliest practicable time.

(1989 Stipulation ¶ 7.) If the Secretary eventually decided against an adjustment to the census, his decision was to be accompanied by a "detailed statement of its grounds." (*Id.*

¶ 5.) The 1989 Stipulation was approved by the district court in an order dated July 17, 1989 ("1989 Order").

D. *The DOC Guidelines and NYC v. DOC II*

Following the 1989 Stipulation, DOC appointed an eight-member Advisory Panel, which consisted of four persons selected from a list of seven candidates submitted by plaintiffs, and four members chosen by DOC without input from plaintiffs. DOC proposed and received comments on a set of guidelines, and in March 1990, it promulgated the following final Guidelines:

> 1. The Census shall be considered the most accurate count of the population of the United States, at the national, state, and local level, unless an adjusted count is shown to be more accurate. The criteria for accuracy shall follow accepted statistical practice and shall require the highest level of professional judgment from the [Bureau]. No statistical or inferential procedure may be used as a substitute for the Census. Such procedures may only be used as supplements to the Census.
>
> 2. The 1990 Census may be adjusted if the adjusted counts are consistent and complete across all jurisdictional levels: national, state, local, and census block. The resulting counts must be of sufficient quality and level of detail to be usable for Congressional reapportionment and legislative redistricting, and for all other purposes and at all levels for which census counts are published.

3. The 1990 Census may be adjusted if the estimates generated from the pre- specified procedures that will lead to an adjustment decision are shown to be more accurate than the census enumeration. In particular, these estimates must be shown to be robust to variations in reasonable alternatives to the production procedures, and to variations in the statistical models used to generate the adjusted figures.

4. The decision whether or not to adjust the 1990 Census should take into account the effects such a decision might have on future census efforts.

5. Any adjustment of the 1990 Census may not violate the United States Constitution or Federal statutes.

6. There will be a determination whether to adjust the 1990 Census when sufficient data are available, and when analysis of the data is complete enough to make such a determination. If sufficient data and analysis of the data are not available in time to publish adjusted counts by July 15, 1991, a determination will be made not to adjust the 1990 Census.

7. The decision whether or not to adjust the 1990 Census shall take into account the potential disruption of the process of the orderly transfer of political representation likely to be caused by either course of action.

8. The ability to articulate clearly the basis and implications of the decision whether or not to adjust

> shall be a factor in the decision. The general rationale for the decision will be clearly stated. The technical documentation behind the adjustment decision shall be in keeping with professional standards of the statistical community.

See NYC v. DOC II, 739 F.Supp. at 769 (emphasis omitted).

In April 1990, plaintiffs challenged the Guidelines, contending that, in violation of the 1989 Order, they were impermissibly vague and were biased against any adjustment to the 1990 census. Plaintiffs also requested a declaratory judgment that a statistical adjustment to the census would not violate the Constitution or any federal statute. Defendants opposed, contending that any decision by the Secretary on whether or not to adjust the census presented a nonjusticiable political question, and that, in any event, since the Secretary could still elect to adjust the census, plaintiffs' requests were premature.

The district court rejected defendants' contention that these motions presented nonjusticiable issues, and it granted plaintiffs' request for a declaration that statistical adjustment would not of itself violate either the Constitution or the laws of the United States, *see NYC v. DOC II*, 739 F.Supp. at 767. As to the attack on the Guidelines, the court ruled that, while they were vague and while some of them "lend themselves easily to abuse," *id.* at 770, the Guidelines satisfied defendants' obligations under the 1989 Stipulation and were not unduly biased against adjustment, *see id.*

E. *The Implementation and Results of the 1990 Census*

In eventually conducting the 1990 census, the Census Bureau used a four-step process for the initial enumeration. It followed with a PES as required by the 1989 Stipulation.

1. *The Initial Enumeration*

As a first step in the enumeration, the Bureau compiled a list indicating every household in the nation to which the Bureau would send questionnaires. Since the Bureau would rely on the mail return of those questionnaires to count most of the population, an accurate and comprehensive list was vital. In constructing the list, the Bureau relied primarily on commercial mailing lists, supplemented by extensive field research and collaboration with the United States Postal Service. Numerous quality controls were instituted to improve the accuracy of the list.

Step two was the "mail out/mail back" phase, in which census questionnaires were mailed to each housing unit, and members of each household were asked to complete and return the questionnaires to the local census office on or before April 1, 1990 ("Census Day"). The Bureau's efforts to encourage participation in this phase included a general advertising campaign; campaigns specifically directed at African-Americans, Hispanics, Asian-Pacific Islanders, and Native Americans; publication of specialized foreign-language brochures; maintenance of a set of toll-free telephone numbers providing answers in any of eight languages for persons having questions regarding the questionnaire, including one number from which callers could request questionnaires written in Spanish. The Bureau employed different outreach methods in areas where it was

believed that the normal procedure would be particularly ineffective.

The return rate of questionnaires in phase two was only 63 percent. Step three was a follow-up phase. The Bureau sent second mailings to households that had failed to return forms; in census districts with particularly low return rates, it remailed forms to all residents.

In the fourth phase, the Bureau engaged in a further, largely in-person, "nonresponse follow-up" with respect to households that still had not returned questionnaires. Each nonresponding unit was assigned a census enumerator who was to make as many as six attempts to contact a household member to obtain the information necessary to complete a census form. If these efforts proved unproductive, the enumerator would try to obtain basic information on the missing housing unit from a neighbor, building manager, or other reliable source. Once 95 percent of a district's operations were completed, enumerators made one final attempt to visit each remaining nonresponding household to obtain as complete an interview as possible. Then the Bureau implemented "Coverage-Improvement Programs," which included (1) a 100-percent recheck of vacant or uninhabitable units, (2) a "Were you counted?" advertising campaign to reach people who thought they might have been missed by the census, (3) a parolee and probationer check to set the names and Census Day addresses of those people a... add them to the census if they had not already been counted, (4) a housing coverage check, in which the Bureau recanvassed select blocks, and (5) a local government review program, which provided local governments with an opportunity to challenge census counts for their areas. The

Bureau's follow-up efforts in phase four added 5.4 million people, bringing the total count to 249,632,692.

2. *The PES*

The Bureau also implemented the PES. In preparation, the Bureau had selected approximately 5,000 blocks to achieve what it deemed an appropriate sample size for each of the 1,392 poststrata previously developed; in February 1990, Bureau employees had visited each sample block and listed all the housing units they found, identifying approximately 170,000 households.

After the Census Day enumeration, Bureau interviewers returned to each address in the sample blocks to obtain information regarding the residency status of those households on Census Day, and discovered that those blocks contained approximately 400,000 people. The Bureau then compared the data obtained in these visits against the information collected in the original enumeration of the sample blocks. From this comparison, the Bureau estimated rates of omission and rates of erroneous overcounting, and calculated a net rate for each poststratum. The Bureau used these results to develop an "adjustment factor" for each poststratum, *i.e.*, a number which, when multiplied by the population count as indicated by the actual enumeration, would reflect the variations found in the PES. The 1,392 poststrata resulted in 1,392 corresponding adjustment factors.

After the use of statistical "smoothing," the Bureau applied the smoothed adjustment factors to produce adjusted counts down to the block level; these counts were then aggregated to provide population estimates for cities, counties, states, and the nation. The Bureau then

implemented quality-control checks, including more than twenty formal research projects which analyzed potential sources of error within the PES. The results of these studies were then combined in a "total error model," which summarized the overall quality of the PES data.

3. *The Results Shown by the Combined Enumeration and PES*

In the end, estimates drawn from the PES revealed that the enumeration resulted in a national undercount of 2.1 percent, or approximately 5.3 million persons out of a total population of approximately 255 million. As was expected, the undercount was greater for members of racial and ethnic minorities. Hispanics were undercounted by 5.2 percent, Native Americans by 5.0 percent, African-Americans by 4.8 percent, and Asian-Pacific Islanders by 3.1 percent. The PES-calculated undercount for non-African-Americans was 1.7 percent, and for non-Hispanic Whites, 1.2 percent. The impact of the differential undercount was naturally more severe in those areas in which racial and ethnic minorities were more concentrated. If the adjusted count indicated by the PES were adopted, Arizona and California would each gain a seat in the House of Representatives; Wisconsin and Pennsylvania would each lose one seat.

F. *The Secretary's 1991 Decision Not To Adjust*

The Secretary decided not to adjust the 1990 census. The population count reported to the President was thus 249,632,692 rather than 254,902,609 as indicated by the enumeration supplemented by the PES.

The Secretary's decision was issued on July 15, 1991, in a 178-page document entitled "Decision of the Secretary of Commerce on Whether a Statistical Adjustment of the 1990 Census of Population and Housing Should be Made for Coverage Deficiencies Resulting in an Overcount or Undercount of the Population" ("Secretary's 1991 Decision" or "Decision"). Stating that "Blacks appear to have been undercounted in the 1990 census by 4.8%, Hispanics by 5.2%, Asian-Pacific Islanders by 3.1%, and American Indians by 5.0%, while non-Blacks appear to have been undercounted by 1.7%," the Secretary acknowledged that the enumeration "was lower than average among certain segments of our population," but stated that "[i]f we change the counts by a computerized, statistical process, we abandon a two hundred year tradition of how we actually count people." (Secretary's Decision at 1-1.)

Though acknowledging that the PES-indicated adjustment would appear to make the aggregate national count more accurate, reflecting more accurately both the total population of the country and certain racial and ethnic subpopulations of the country (*id.* at 2-1), the Secretary was concerned that with respect to places having populations of less than 100,000 there was no direct evidence that the adjusted counts would be more accurate. He stated that while at the state and local levels the statistical analyses had not been completed, "the total error model" suggested that "the adjusted figures tend to be too high." The Secretary acknowledged, however, that the adjusted figures were "generally closer in numeric terms to the true population than the census counts which tend to be too low." (*Id.* at 2-1.) The Secretary also recognized that up to 2/3 of the population "lives in jurisdictions where the adjusted counts appear more accurate," and that only "one third of the

population lives in areas where the census appears more accurate." (*Id.* at 1-5.) He concluded, however, that "[t]he loss function analysis and hypothesis tests that have been prepared by the Census Bureau to date, although of uncertain reliability, do support the superior accuracy of the census counts versus the adjusted figures when we consider distributive accuracy--or fairness--and use reasonable estimates of the error variance of the alternative" PES-based adjustment. (*Id.* at 2-2.) The Secretary defined "distributive accuracy" as "getting most nearly correct the proportions of people in different areas." (*Id.* at 2-1.) He declined to use the adjustments unless not only numerical accuracy but also distributive accuracy would be increased.

In sum, though conceding that the adjustments would likely bring greater accuracy in the count at the national level, the Secretary expressed the principal concerns (1) that adjustment might not improve distribution of Representatives among the states; (2) that about half of his advisors believed accuracy at the state and local levels would not be improved; and (3) that uncertainty as to the methods of adjustment and assumptions behind them might engender dispute about the accuracy of the census and create the danger that an adjustment might "be made on the basis of research conclusions that may well be reversed in the next several months" (Secretary's 1991 Decision at 1-8). In addition, he expressed the concern that the adjustment process might be subject to manipulation, since the effects of different adjustment methods could be ascertainable in advance; he stated, however, that he was confident that there had been no such manipulation with respect to the 1990 PES.

The Secretary also noted the divergence of views among his advisors. The Advisory Panel split evenly, with

the four members selected from plaintiffs' list recommending adjustment, and the four members chosen solely by DOC recommending against it. The Undercount Steering Committee voted seven to two in favor of adjustment, and both the Under-Secretary of Commerce for Economic Affairs and the Administrator of the Economics and Statistics Administration voted against adjustment. The Director of the Census Bureau, while recognizing that "adjustment is an issue about which reasonable men and women and the best statisticians and demographers can disagree" (Administrative Record, Defendants' Exhibit 1, at 1118), recommended in favor of adjustment.

G. *The Trial and NYC v. DOC III*

Plaintiffs attacked the Secretary's 1991 Decision as a self-serving, post-hoc compilation of documents assembled for the purpose of strengthening DOC's position, and contended that the Secretary's decision was tainted by partisan political influence and violated the Constitution, the APA, and the 1989 Stipulation. After yet another unsuccessful motion by defendants to dismiss the action on nonjusticiability grounds, and after a consolidation of the case with two others presenting identical issues, *City of Atlanta v. Mosbacher*, 92-CV-1566, and *Florida House of Representatives v. Franklin*, 92-CV-2037, a 13-day bench trial was held. The evidence consisted chiefly of the testimony of experts in demographics and statistics, hundreds of exhibits, and numerous deposition transcripts.

Following the trial, the district court entered its findings of fact and conclusions of law. Though it confirmed its earlier ruling that it had the authority to review the Secretary's decision not to adjust the census, because

"'Article I, § 2 requires the census to be as accurate as practicable,'" *NYC v. DOC III*, 822 F.Supp. at 919 (quoting *NYC v. DOC II*, 739 F.Supp. at 767), and though the court found substantial merit in plaintiffs' contentions that the PES-indicated adjustment in the 1990 census was warranted, it rejected plaintiffs' claims and dismissed the complaint on the basis of the standard of review to be applied. *See NYC v. DOC III*, 822 F.Supp. 906.

The court found that "for most purposes the PES resulted in a more accurate--or to be statistically fashionable, a less inaccurate--count than the original census." *NYC v. DOC III*, 822 F.Supp. at 916. Plaintiffs contended that the Secretary's finding of greater distributive accuracy in the loss function analysis was flawed because it was based solely on the larger number of states where greater distributive accuracy was produced by the unadjusted count, without regard for the fact that adjustment produced greater distributive accuracy for the larger percentage of the nation's population; plaintiffs also challenged the rationality of "the Secretary's rejection of numerous loss function analyses performed by the Bureau supporting the superior accuracy of the adjusted counts, and his putative concern with the technical aspects of the PES." The court found that these challenges constituted "a compelling attack on the Decision." *NYC v. DOC III*, 822 F.Supp. at 923 (italics omitted).

However, adhering to its *NYC v. DOC I* ruling that the Secretary's refusal to adjust the census was to be reviewed under the APA's arbitrary-and-capricious standard, the district court concluded that it could not overturn the Secretary's decision. The court stated that

> [t]he conclusion that the Secretary must provide the most accurate census practicable ... does not[ ] lead inexorably to the conclusion that a decision against adjustment is therefore unconstitutional. In deciding whether the Secretary's decision was arbitrary and capricious in light of the requirement that the decision provide the most accurate census practicable, the Court must turn to the Secretary's consideration of the [G]uidelines, which help to illuminate the meaning of both "accuracy" and "practicability."

NYC v. DOC III, 822 F.Supp. at 920. The court reviewed the Secretary's evaluation of the PES-indicated adjustments against each of the eight Guidelines, and found that none of the Guidelines was applied in an arbitrary or capricious manner. For example, the court found that, in applying Guideline One, the Secretary's "decision to focus on distributive, rather than numeric, accuracy was consonant with the constitutional goal of assuring the most accurate census practicable, given the census's function as a standard by which to distribute political representation and economic benefits." *Id.* a: 924. The district court also found that the Secretary's skepticism concerning the methodology of adjustment was not an inappropriate consideration. *See id.*

The court concluded that

> [p]laintiffs have made a powerful case that discretion would have been more wisely employed in favor of adjustment. Indeed, were this Court called upon to decide this issue *de novo*, I would probably have ordered the adjustment. However, it is not within my province to make such determinations. The question

> is whether the Secretary's decision not to adjust is so beyond the pale of reason as to be arbitrary or capricious. That far I cannot go.

Id. at 928-29 (footnote omitted). The court added that "[w]hile plaintiffs' counsel has illustrated that adjustment is statistically feasible, and would improve the quality of the counts for most purposes while ameliorating the profoundly disturbing problem of differential undercount, the Court cannot, on the record before it, supplant the Secretary's decision." *NYC v. DOC III*, 822 F.Supp. at 931.

This appeal followed.

II. DISCUSSION

On appeal, plaintiffs challenge the district court's use of the arbitrary-and-capricious standard of review and contend that the court should have reviewed the Secretary's Decision *de novo*. While we agree with the district court's rejection of the *de novo* standard, we disagree with its use of the arbitrary-and-capricious standard. For the reasons below, we conclude that, given the concededly greater accuracy of the adjusted count, the Secretary's decision was not entitled to be upheld without a showing by the Secretary that the refusal to adjust the census was essential to the achievement of a legitimate governmental objective.

A. *Statutory Authorization for Statistical Adjustment*

Preliminarily, we reject the contention of intervenors-defendants-appellees, relying on 13 U.S.C. § 195, that any statistical adjustment of the census is barred by

the Census Act (the "Act"). As presently formulated, § 195 of the Act provides as follows:

> *Except for the determination of population for purposes of apportionment of Representatives in Congress among the several States*, the Secretary shall, if he considers it feasible, authorize the use of the statistical method knowing as "sampling" in carrying out the provisions of this title.

13 U.S.C. § 195 (1988) (emphasis added). Since any reapportionment of Representatives hinges on the number of persons "as ascertained under the ... decennial census," 2 U.S.C. § 2a(a) (1988), § 195 might appear to preclude the use of sampling in connection with the decennial census, as contrasted with a mid-decade census. However, § 195 must be read in conjunction with § 141 of the Act and in light of the Act's legislative history.

Section 141, as presently formulated, reads as follows:

> The Secretary *shall*, in the year 1980 and every 10 years thereafter, *take a decennial census* of population as of the first day of April of such year, *... in such form and content as he may determine, including the use of sampling procedures and special surveys*.

13 U.S.C. § 141(a) (1988) (emphasis added). Thus, § 141(a) plainly provides for the use of sampling and surveys in connection with the decennial census.

Section 141's provision for sampling was added in 1976. *See* Pub.L. 94-521, 90 Stat. 2459 ("1976 Act"). Previously, that section had made no provision whatever for sampling or special surveys; and while § 195 had mentioned such methods, it did not appear to urge their use. The prior version of § 195 read as follows:

> Except for the determination of population for apportionment purposes, the Secretary *may*, where he deems it *appropriate*, authorize the use of the statistical method known as "sampling" in carrying out the provisions of this title.

13 U.S.C. § 195 (1970) (emphasis added). In the 1976 Act, the present version of § 195, quoted at the beginning of this section, was adopted in order to strengthen the call for use of sampling. Thus, whereas the pre-1976 version of § 195 provided that statistical sampling "may" be used where "appropriate," the present version provides that such methods "shall" be used where "feasible." The legislative history indicated that, by "if ... feasible" Congress meant "whenever possible":

> Section 10 amends section 195 of title 13, U.S.C., to require that the Secretary of Commerce authorize the use of sampling procedures in carrying out the provisions of this title whenever he deems it feasible, except in the apportionment of the U.S. House of Representatives. This differs from present language which grants the Secretary discretion to use sampling when it is considered appropriate. *This section as amended strengthens congressional intent that, whenever possible, sampling shall be used.*

Report of the Senate Post Office and Civil Service Committee 94-1256 ("S.Rep.") at 6, *reprinted in* 1976 U.S.Code Cong. & Admin. News ("USCCAN") at 5468 (emphasis added). The Senate Report further explained that the 1976 Act inserted the authorizing language in § 141 in order "to encourage the use of sampling and surveys in the taking of the decennial census." S.Rep. at 4, *reprinted in* 1976 USCCAN 5466; *see also* Conf.Rep. No. 94-1719, at 13, *reprinted in* 1976 USCCAN at 5481 (Senate and House of Representatives proposals same with respect to amendment of § 141). In addressing the 1976 Act as a whole, the Senate Report stated that one of "[t]he purposes of this legislation [was] ... to direct the Secretary of Commerce to use sampling and special surveys in lieu of *total* enumeration in the collection of statistical data whenever feasible...." S.Rep. at 1, *reprinted in* 1976 USCCAN at 5463-64 (emphasis added).

Reading §§ 141 and 195 together in light of their legislative history, we conclude that Congress intended the Secretary (a) to conduct an actual enumeration as part of the decennial census, and (b) in lieu of a "total" enumeration, S.Rep. at 1, *reprinted in* 1976 USCCAN at 5464, to use sampling and special surveys "whenever possible," *id.* at 6, *reprinted in* 1976 USCCAN at 5468. Accordingly, we conclude that a statistical adjustment to the initial enumeration is not barred by the Census Act and indeed was meant to be encouraged.

We turn, therefore, to the question of what standard should have been used by the district court in this case in reviewing the Secretary's decision not to adjust the census.

B. *The Standard of Review*

In reasoning that the district court should have applied a standard of review more stringent than the arbitrary-and-capricious test, we begin with a review of Supreme Court decisions in cases involving apportionment and the right to vote, most of which focused on the drawing of voting districts by states. In *Baker v. Carr*, 369 U.S. 186, 82 S.Ct. 691, 7 L.Ed.2d 663 (1962), presented with equal protection challenges to the apportionment of seats for the Tennessee state legislature, the Court rejected the defendants' contentions (a) that apportionment presented a nonjusticiable political issue, and (b) that the plaintiffs had no standing to seek judicial review. *Id.* at 209, 82 S.Ct. at 706. The Court observed that "[a] citizen's right to a vote free of arbitrary impairment by state action has been judicially recognized as a right secured by the Constitution, when such impairment resulted from *dilution by a false tally* ...." *Id.* at 208, 82 S.Ct. at 705 (citing *United States v. Classic*, 313 U.S. 299, 61 S.Ct. 1031, 85 L.Ed. 1368 (1941) (emphasis ours)).

In *Wesberry v. Sanders*, 376 U.S. 1, 84 S.Ct. 526, 11 L.Ed.2d 481 (1964) ("*Wesberry*"), the Court, reviewing the drawing of congressional districts in Georgia, confirmed that "[t]he right to vote is too important in our free society to be stripped of judicial protection by" an interpretation of Article I that would shield from judicial review state congressional apportionment systems that debase a citizen's right to vote. *Id.* at 7, 84 S.Ct. at 529. Noting that "[t]he history of the Constitution, particularly that part of it relating to the adoption of Art. I, § 2, reveals that those who framed the Constitution meant that, no matter what the mechanics of an election, whether statewide or by districts, it was

population which was to be the basis of the House of Representatives," 376 U.S. at 8-9, 84 S.Ct. at 530, the *Wesberry* Court held that,

> construed in its historical context, the command of Art. I, § 2, that Representatives be chosen "by the People of the several States" means that *as nearly as is practicable one man's vote in a congressional election is to be worth as much as another's* .... To say that a vote is worth more in one district than in another would not only run counter to our fundamental ideas of democratic government, it would cast aside the principle of a House of Representatives elected "by the People," a principle tenaciously fought for and established at the Constitutional Convention.

376 U.S. at 7-8, 84 S.Ct. at 530 (footnotes omitted) (emphasis added). The Court concluded that

> [w]hile it may not be possible to draw congressional districts with mathematical precision, that is no excuse for ignoring our Constitution's plain objective of making equal representation for equal numbers of people the fundamental goal for the House of Representatives. That is the high standard of justice and common sense which the Founders set for us.

Id. at 18, 84 S.Ct. at 535.

The principles set out in *Wesberry* were further explained in *Reynolds v. Sims*, 377 U.S. 533, 84 S.Ct. 1362, 12 L.Ed.2d 506 (1964), which struck down an Alabama

scheme that had resulted in state legislative districts of widely disparate size. The Court noted that

> [t]he right to vote freely for the candidate of one's choice is of the essence of a democratic society, and any restrictions on that right strike at the heart of representative government. *And the right of suffrage can be denied by a debasement or dilution of the weight of a citizen's vote just as effectively as by wholly prohibiting the free exercise of the franchise.*

Id. at 555, 84 S.Ct. at 1378 (emphasis added). The *Reynolds v. Sims* Court discussed *Wesberry* as follows:

> We determined [in *Wesberry*] that the constitutional test for the validity of congressional districting schemes was one of substantial equality of population among the various districts established by a state legislature for the election of members of the Federal House of Representatives.
>
> In that case we decided that an apportionment of congressional seats which "contracts the value of some votes and expands that of others" is unconstitutional, since "the Federal Constitution intends that when qualified voters elect members of Congress each vote be given as much weight as any other vote...." We concluded that the *constitutional prescription for election of members of the House of Representatives "by the People," construed in its historical context, "means that as nearly as is practicable one man's vote in a congressional election is to be worth as much as another's."* We further stated:

> "It would defeat the principle solemnly embodied in the Great Compromise--equal representation in the House for equal numbers of people--for us to hold that, within the States, legislatures may draw the lines of congressional districts in such a way as to give some voters a greater voice in choosing a Congressman than others."

We found further, in *Wesberry*, that "our Constitution's plain objective" was that "of making equal representation for equal numbers of people the fundamental goal...." We concluded by stating:

> "No right is more precious in a free country than that of having a voice in the election of those who make the laws under which, as good citizens, we must live. Other rights, even the most basic, are illusory if the right to vote is undermined. Our constitution leaves no room for classification of people in a way that unnecessarily abridges this right."

Reynolds v. Sims, 377 U.S. at 559-60, 84 S.Ct. at 1380 (emphasis added).

In *Kirkpatrick v. Preisler*, 394 U.S. 526, 89 S.Ct. 1225, 22 L.Ed.2d 519 (1969), which involved a drawing of congressional districts in Missouri which resulted in a 1.06 to 1 ratio of the largest district to the smallest, the Court elucidated the *Wesberry/Reynolds v. Sims* as-nearly-as-practicable standard. The Court reject[ed] Missouri's argument that there is a fixed numerical or percentage population variance small enough to be considered *de minimis* and to satisfy without question the "as nearly as

practicable" standard. The whole thrust of the "as nearly as practicable" approach is inconsistent with adoption of fixed numerical standards which excuse population variances without regard to the circumstances of each particular case. The extent to which equality may practicably be achieved may differ from State to State and from district to district. Since "equal representation for equal numbers of people [is] the fundamental goal for the House of Representatives," *Wesberry v. Sanders*, *supra*, 376 U.S. at 18, 84 S.Ct. at 535, the "as nearly as practicable" standard requires that the State make a good-faith effort to achieve precise mathematical equality. See *Reynolds v. Sims*, 377 U.S. 533, 577, 84 S.Ct. 1362, 1390, 12 L.Ed.2d 506 (1964). Unless population variances among congressional districts are shown to have resulted despite such effort, the state must justify each variance, no matter how small.

....

Equal representation for equal numbers of people is a principle designed to prevent debasement of voting power and diminution of access to elected representatives. Toleration of even small deviations detracts from these purposes. Therefore, the command of Art. I, § 2, that States create congressional districts which provide equal representation for equal numbers of people permits only the limited population variances which are unavoidable despite a good-faith effort to achieve absolute equality, or for which justification is shown.

Clearly, the population variances among the Missouri congressional districts were not unavoidable. Indeed it is not seriously contended that the Missouri Legislature came as close to equality as it might have come.... [I]t is simply

inconceivable that population disparities of the magnitude found in the Missouri plan were unavoidable.

Kirkpatrick v. Preisler, 394 U.S. at 530-32, 89 S.Ct. at 1229.

In *Karcher v. Daggett*, 462 U.S. 725, 103 S.Ct. 2653, 77 L.Ed.2d 133 (1983), the Court confirmed the strictness of this standard when it upheld the invalidation of a New Jersey congressional districting plan where the population of the largest district was less than 1% greater than the population of the smallest. Quoting the *Wesberry/Reynolds v. Sims* "as nearly as practicable" language, 462 U.S. at 730, 103 S.Ct. at 2658, the Court held that deviations could not be sanctioned where, though small, they "were not the result of a good-faith effort to achieve population equality," *id.* at 727, 103 S.Ct. at 2656.

In sum, the Supreme Court has long held that the right to vote is too important to be deprived of judicial protection; that that right is impaired not only by total disenfranchisement but also by dilution, because the Constitution calls for one person's vote to be worth as much as another's as nearly as is practicable; that dilution may result from creating voting districts of different sizes or from "a false tally"; and that, in apportioning legislative seats through districting, a state must make a good-faith effort to achieve the goal of "one-person, one-vote."

The root of the guarantee of "one-person, one-vote" is the Constitution's guarantee to all persons of the equal protection of the law. *See, e.g., New York City Board of Estimate v. Morris*, 489 U.S. 688, 699, 109 S.Ct. 1433, 1441, 103 L.Ed.2d 717 (1989) ("*Reynolds v. Sims* line of

cases" reflects an "equal protection approach"); *id.* at 692, 109 S.Ct. at 1437-38 ("equal protection guarantee of 'one-persor, one-vote'"); *Hadley v. Junior College District*, 397 U.S. 50, 56, 90 S.Ct. 791, 795, 25 L.Ed.2d 45 (1970) ("as a general rule, whenever a state or local government decides to select persons by popular election to perform governmental functions, the Equal Protection Clause of the Fourteenth Amendment requires that each qualified voter must be given an equal opportunity to participate in that election, and when members of an elected body are chosen from separate districts, each district must be established on a basis that will insure, as far as is practicable, that equal numbers of voters can vote for proportionately equal numbers of officials"); *Baker v. Carr*, 369 U.S. at 209-10, 82 S.Ct. at 706. The equal protection requirement appears explicitly in the Fourteenth Amendment, which applies to the states, and is a component of the Due Process Clause of the Fifth Amendment, which applies to the federal government. *See, e.g., United States Department of Agriculture v. Moreno*, 413 U.S. 528, 93 S.Ct. 2821, 37 L.Ed.2d 782 (1973); *id.* at 533 n. 5, 93 S.Ct. at 2825 n. 5 ("'[w]hile the Fifth Amendment contains no equal protection clause, it does forbid discrimination that is "so unjustifiable as to be violative of due process"'" (quoting *Schneider v. Rusk*, 377 U.S. 163, 168, 84 S.Ct. 1187, 1190, 12 L.Ed.2d 218 (1964))); *Shapiro v. Thompson*, 394 U.S. 618, 641-42, 89 S.Ct. 1322, 1335, 22 L.Ed.2d 600 (1969); *Bolling v. Sharpe*, 347 U.S. 497, 74 S.Ct. 693, 98 L.Ed. 884 (1954). Because the right to equal apportionment is rooted in the right to equal protection, a court faced with a challenge to the constitutionality of an apportionment system is not called upon to "enter upon policy determinations for which judicially manageable standards are lacking. Judicial standards under the Equal Protection Clause are well

developed and familiar," and applicable. *Baker v. Carr*, 369 U.S. at 226, 82 S.Ct. at 715.

Under the familiar judicial standards, a claim of denial of equal protection subjects the challenged governmental act to a degree of scrutiny that depends in part on the nature of the affected right and in part on the nature of the classification. At one end of the spectrum, a program that (a) is social or economic in nature, and (b) is not alleged to discriminate on the basis of inherently suspect classifications or to implicate "fundamental" personal rights, will not be held to violate equal protection principles if it has any rational relationship to a legitimate governmental purpose. *See, e.g., Schweiker v. Wilson*, 450 U.S. 221, 230, 101 S.Ct. 1074, 1080, 67 L.Ed.2d 186 (1981); *City of New Orleans v. Dukes*, 427 U.S. 297, 303, 96 S.Ct. 2513, 2516-17, 49 L.Ed.2d 511 (1976) (per curiam). At the other end of the spectrum, a scheme that either (a) impinges on the exercise of a fundamental personal right, or (b) disadvantages a "suspect" class, such as a racial or ethnic group, has traditionally been subject to strict scrutiny to determine whether the scheme is "precisely tailored to serve a compelling governmental interest." *Plyler v. Doe*, 457 U.S. 202, 217, 102 S.Ct. 2382, 2395, 72 L.Ed.2d 786 (1982); *see, e.g., Kramer v. Union Free School District No. 15*, 395 U.S. 621, 627-30, 89 S.Ct. 1886, 1889-91, 23 L.Ed.2d 583 (1969) (right to vote in school district election); *Shapiro v. Thompson*, 394 U.S. 618, 638, 89 S.Ct. 1322, 1333, 22 L.Ed.2d 600 (1969) (right to travel); *Skinner v. Oklahoma ex rel. Williamson*, 316 U.S. 535, 541, 62 S.Ct. 1110, 1113, 86 L.Ed. 1655 (1942) (right to procreate). In general, if a law alleged to infringe a certain right directly would require a heightened degree of scrutiny, heightened scrutiny should also be given when the law is alleged to

infringe that right discriminatorily. *See Police Department v. Mosley*, 408 U.S. 92, 96, 101-102, 92 S.Ct. 2286, 2293-94, 33 L.Ed.2d 212 (1972); *Eisenbud v. Suffolk County*, 841 F.2d 42, 45-46 (2d Cir.1988).

In the present case both the nature of the right and the nature of the affected classes are factors that traditionally require that the government's action be given heightened scrutiny: the right to have one's vote counted equally is fundamental and constitutionally protected, and the unadjusted census undercount disproportionately disadvantages certain identifiable minority groups. Inaccuracies in the decennial census affect both the distribution of Representatives among states and the distribution of Representatives within most states, since states use the census figures in drawing district lines. Though the differential undercount has been noted, *see, e.g., Karcher v. Daggett*, 462 U.S. at 737 n. 9, 103 S.Ct. at 2662 n. 9 ("the rate of undercount in the census for black population on a nationwide basis is significantly higher than the rate of undercount for white population"), that disparate effect has been tolerated in the past only because the census figures were considered to be "the 'best population data available,'" *see id.* at 738, 103 S.Ct. at 2662 (quoting *Kirkpatrick v. Preisler*, 394 U.S. at 528, 89 S.Ct. at 1227). Here, however, the district court implicitly found that the census did not achieve equality of voting power as nearly as practicable. It found that the PES-indicated statistical adjustment was feasible; that for most purposes and for most of the population that adjustment would result in a more accurate count than the original census; and that the adjustment would lessen the disproportionate undercounting of minorities. Equal protection analysis requires that heightened scrutiny be given to the Secretary's decision to

adhere to an acknowledged undercount that concededly impacts minority groups more severely than nonminority groups. Governmental action that disproportionately denies representation on the basis of race or ethnicity cannot be upheld solely on the basis that the action was "not so far beyond the pale of reason as to be arbitrary or capricious," *NYC v. DOC III*, 822 F.Supp. at 929.

There are, of course, differences between the present case and the *Wesberry/Reynolds v. Sims* line of cases because the present case focuses not on action by a state within its boundaries but rather on federal action that is nationwide in scope. One difference is the result of institutional factors. When the defendant is a state entity, the Supremacy Clause of the Constitution, Art. VI, cl. 2, is applicable, and federal law prevails. When the defendant is the federal government, the Supremacy Clause does not come into play, and a court must give effect to the principle of separation of powers. *See, e.g., Department of Commerce v. Montana*, --- U.S. ----, ----, 112 S.Ct. 1415, 1426, 118 L.Ed.2d 87 (1992) ("*DOC v. Montana*"). In our view, the latter factor means that, except with respect to questions of law, a court generally should not review decisions of the Executive Branch under a *de novo* standard.

A second difference between cases involving state actors and those involving federal actors is the result of constraints that are in part geographical. While it may be possible for a state to achieve equality of population in its congressional election districts, efforts toward such a goal nationwide are constrained by three constitutional requirements: (1) that each state be allotted at least one Representative, (2) that the number of Representatives not exceed one for every 30,000 persons, and (3) that

congressional election districts not cross state boundaries. Given these constraints, the goal of precise equality in voting power is "illusory for the Nation as a whole." *DOC v. Montana*, --- U.S. at ----, 112 S.Ct. at 1429. That the goal of precise equality cannot be achieved nationwide on account of those constraints, however, does not relieve the federal government of the obligation to make a good-faith effort to achieve voting-power equality "as nearly as is practicable." *See id.* at ---- - ----, 112 S.Ct. at 1426-29 (relying on *Wesberry/Reynolds v. Sims* line of cases and applying good-faith test in challenge to federal apportionment legislation); *Franklin v. Massachusetts*, --- U.S. ----, ----, 112 S.Ct. 2767, 2777, 120 L.Ed.2d 636 (1992) (reviewing merits of census claim to "determin[e] whether the Secretary's [judgment in allocating overseas military personnel among states] is consistent with the constitutional language and the constitutional goal of equal representation" (citing *DOC v. Montana*)). We conclude that the federal government, no less than the states, is required to make a good-faith effort to achieve the Constitution's plain objective of equal representation for equal numbers of people. The impossibility of achieving precise mathematical equality is no excuse for not making this mandated good-faith effort.

C. *Burdens of Proof*

Although for most types of equal protection claims, a plaintiff must show that the government's discrimination was intentional, *see, e.g., Village of Arlington Heights v. Metropolitan Housing Development Corp.*, 429 U.S. 252, 265-66, 97 S.Ct. 555, 563-64, 50 L.Ed.2d 450 (1977) (housing); *Washington v. Davis*, 426 U.S. 229, 239-45, 96 S.Ct. 2040, 2047-50, 48 L.Ed.2d 597 (1976) (employment), the Supreme Court has not imposed such a requirement in

any of the cases involving apportionment. As the Seventh Circuit noted in *Tucker v. United States Department of Commerce*, 958 F.2d 1411 (7th Cir.), *cert. denied*, --- U.S. ----, 113 S.Ct. 407, 121 L.Ed.2d 332 (1992), cases such as *Reynolds v. Sims*

> do not place on plaintiffs any burden of proving that a malapportionment represents a deliberate effort to dilute some group's voting power. It is enough that the state's electoral districts are malapportioned. We assume that those cases survive the later ones, such as *Washington v. Davis*, *supra*, that require proof of intentional discrimination. The purpose of *that* requirement is to prevent the concept of equal protection from being used to invalidate governmental policies that just happen to bear more heavily against a vulnerable group, whereas the reapportionment cases vindicate a right that the Supreme Court has found to be implicit in the Constitution to an apportionment mechanism that will, so far as possible give each person's vote the same weight in an election. A state's failure to create the required mechanism is an intentional denial of the right to an equally weighted vote.

958 F.2d at 1414 (emphasis in original). Rather, the Supreme Court has held that the burden of a plaintiff asserting an apportionment claim is simply to show that the governmental entity failed to make a good-faith effort to achieve equal districts as nearly as practicable. Thus, in *Karcher v. Daggett*, the Court stated the principal issue as

> whether the population differences among districts could have been reduced or eliminated altogether by

> a good-faith effort to draw districts of equal population. Parties challenging apportionment legislation must bear the burden of proof on this issue, and if they fail to show that the differences could have been avoided the apportionment scheme must be upheld. If, however, the plaintiffs can establish that the population differences were not the result of a good-faith effort to achieve equality, the State must bear the burden of proving that each significant variance between districts was necessary to achieve some legitimate goal.

462 U.S. at 730-31, 103 S.Ct. at 2658. Once the plaintiff shows that a scheme was not the product of a good-faith effort to achieve equality, "the burden shift[s] to the [governmental entity] to prove that the population deviations in its plan were *necessary* to achieve some legitimate state objective." *Id.* at 740, 103 S.Ct. at 2663 (emphasis added); *see also Kirkpatrick v. Preisler*, 394 U.S. at 532, 89 S.Ct. at 1229-30 (state did not carry its burden of showing that disparity was "unavoidable"); *Reynolds v. Sims*, 377 U.S. at 560, 84 S.Ct. at 1381 (Constitution prohibits "'unnecessar[ ]ly'" abridgement of right to vote (quoting *Wesberry*, 376 U.S. at 18, 84 S.Ct. at 535)).

In those cases in which a plaintiff is required to show that discrimination was intentional, the requisite intent may be inferred from such factors as "the totality of the relevant facts, including the fact, if it is true, that the law bears more heavily on one race than another," *Washington v. Davis*, 426 U.S. at 242, 96 S.Ct. at 2049, or from the historical background of the decision, *see, e.g., Village of Arlington Heights v. Metropolitan Housing Development Corp.*, 429 U.S. at 267-68, 97 S.Ct. at 564-65, or from the

foreseeability of discriminatory effects, *see, e.g., Columbus Board of Education v. Penick*, 443 U.S. 449, 465, 99 S.Ct. 2941, 2950, 61 L.Ed.2d 666 (1979). The government's "[a]dherence to a particular policy or practice, 'with full knowledge of the predictable effects of such adherence upon racial imbalance,'" is a factor that may be taken into account in determining whether acts were undertaken with discriminatory intent. *Id.* The same types of evidence may support an inference that the discrimination resulted from the lack of a good-faith effort to achieve equality as nearly as practicable.

In the present case, the findings of the district court, set out principally in Part I.G. above, plainly show that plaintiffs carried their burden of proving that the Secretary's refusal to adjust the census in accordance with the PES did not reflect an effort to achieve equality as nearly as practicable. Those findings are supported by, *inter alia*, the Secretary's acknowledgement that the PES-indicated adjustments would likely not only make the census more accurate nationally, but would also reduce the disparate impact of the census' inaccuracies on minority groups, and that he gave other factors priority over achievement of greater accuracy. For example, he stated that he valued "distributive accuracy" over numerical accuracy; and in stating that an adjustment would not be made because it would not result in *greater* distributive accuracy, the Secretary revealed that he would decline to make the generally improving adjustment that would lessen the disproportionate undercounting of minorities if it would result in a distribution of Representatives that would be different from the present distribution, although just as accurate. The Secretary also stated that he felt that eliminating the possibility of manipulation of statistical

surveys in the future was more important than using the admittedly unmanipulated 1990 PES to achieve a more accurate overall count; and that he believed that the use of statistics (notwithstanding Congress's expressed intent to encourage such use) was undesirable because it might reduce state cooperation in the actual enumeration phase of future censuses. He adopted presumptions against any adjustment to the census, stating that greater accuracy at the national level would not lead him to make an adjustment unless it were "convincingly" shown to be not just as accurate, but "more accurate" at every other level as well. (*See, e.g.*, Secretary's Decision at 2-5.)

The inference that the Secretary did not make the required good-faith effort is also supported by the fact that the differential undercount in the 1990 enumeration was plainly foreseeable and foreseen. In the 1940 census and in every census since, members of ethnic and racial minority groups had been undercounted more severely than members of other demographic groups; and the Census Bureau had noted those disproportionate undercounts. Though the Bureau set out to design a program to lessen that effect for the 1990 census, the Secretary initially decided in 1987 that no adjustment would be made; and after the proceedings in this case led to the withdrawal of that decision, the Secretary again decided in 1991 that no adjustment would be made, notwithstanding his acknowledgements that it was generally agreed that at the national level the adjustments would result in greater accuracy, that half of his advisors apparently believed that the adjustments would not reduce accuracy even at regional or local levels, and that a PES-adjusted count appeared to be more accurate in areas encompassing up to two-thirds of the national population.

In sum, we conclude that plaintiffs amply showed that the Secretary did not make the required effort to achieve numerical accuracy as nearly as practicable, and that the burden thus shifted to the Secretary to justify his decision not to adjust the census in a way that the court found would for most purposes be more accurate and would lessen the disproportionate counting of minorities. The Secretary's decision not to make that adjustment is subject to scrutiny not under an arbitrary-and-capricious standard of review but rather under the more traditional standard applicable to an equal protection claim that a fundamental right has been denied on the basis of race or ethnicity. While precise equality is a goal that at the national level may be illusory, there must be a good-faith effort to approach that goal as nearly as is practicable, and the substantive question becomes what choice should be made among imperfect alternatives. When the official answer is that it is preferable to undercount minorities, that answer must be supported by an official showing that that result (a) furthers a governmental objective that is legitimate, and (b) is essential for the achievement of that objective.

CONCLUSION

We have considered all of defendants' arguments in support of the judgment dismissing the complaint and have found them to be without merit. The judgment is vacated, and the matter is remanded for further proceedings not inconsistent with this opinion.

TIMBERS, Senior Circuit Judge, dissenting:

I would affirm on the excellent, comprehensive opinion of Judge McLaughlin reported at 822 F.Supp. 906

(E.D.N.Y.1993). From the majority's refusal to do so, I respectfully but emphatically dissent.

The only two other circuits that have ruled on this issue have agreed with Judge McLaughlin. *City of Detroit v. Franklin*, 4 F.3d 1367 (6 Cir.1993), *cert. denied*, --- U.S. ----, 114 S.Ct. 1217, 127 L.Ed.2d 563 (1994); *Tucker v. U.S. Dept. of Commerce*, 958 F.2d 1411 (7 Cir.), *cert. denied*, --- U.S. ----, 113 S.Ct. 407, 121 L.Ed.2d 332 (1992). The majority decision in the instant case is the only contrary one. Thus it creates a conflict among the circuits.

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

----------X

THE CITY OF NEW YORK,
THE STATE OF NEW YORK,
THE PEOPLE OF THE STATE OF
CALIFORNIA EX REL. DANIEL E.
LUNGREN, ATTORNEY GENERAL,
THE CITY OF LOS ANGELES,
THE CITY OF CHICAGO,
DADE COUNTY, FLORIDA,
THE U.S. CONFERENCE OF MAYORS,
THE NATIONAL LEGUE OF CITIES,
THE LEAGUE OF UNITED LATIN
AMERICAN CITIZENS,
THE NATIONAL ASSOCIATION FOR THE
ADVANCEMENT OF COLORED PEOPLE,
MARCELLA MAXWELL,
DONALD H. ELLIOTT,
JOHN MACK,
OLGA MORALES,
TIMOTHY W. WRIGHT III,
RAYMOND G. ROMERO,
ANTONIO GONZALES, and
ATHALIE RANGE,

Plaintiffs, and

THE STATE OF TEXAS,
THE CITY OF PHOENIX, ARIZONA,
THE STATE OF NEW JERSEY,
THE STATE OF FLORIDA,
THE CITY OF CLEVELAND, OHIO,
THE CITY OF DENVER, COLORADO,

THE CITY OF INGLEWOOD, CALIFORNIA,
THE CITY OF NEW ORLEANS, LOUISIANA,
THE CITY OF OAKLAND, CALIFORNIA,
THE CITY OF PASADENA, CALIFORNIA,
THE CITY OF PHILADELPHIA, PENNSYLVANIA,
THE CITY OF SAN ANTONIO, TEXAS,
THE CITY OF SAN FRANCISCO, CALIFORNIA,
BROWARD COUNTY, FLORIDA,
THE STATE OF ARIZONA,
THE CITY OF BALTIMORE, MARYLAND,
THE CITY OF BOSTON, MASSACHUSETTS,
THE CITY OF LONG BEACH, CALIFORNIA,
THE CITY OF SAN JOSE, CALIFORNIA,
LOS ANGELES COUNTY, CALIFORNIA,
SAN BERNARDINO COUNTY, CALIFORNIA,
THE DISTRICT OF COLUMBIA,
THE NAVAJO NATION,
THE STATE OF NEW MEXICO,
THE CITY OF TUCSON, ARIZONA,
THE COUNTY OF HUDSON, NEW JERSEY and,
THE COUNCIL OF THE GREAT CITY SCHOOLS,

Plaintiff-Intervenors,

-against- 88 CV 3474

UNITED STATES DEPARTMENT OF COMMERCE,
RONALD H. BROWN, as Secretary of the
United States Department of Commerce,
MICHAEL R. DARBY, as Under Secretary for
Economic Affairs of the United States
Department of Commerce,
BUREAU OF THE CENSUS,

BARBARA EVERITT BRYANT, as Director of
the Bureau of the Census,
WILLIAM CLINTON, as President of the
United States, and
DONALD K. ANDERSON, as Clerk of the
United States House of Representatives,

Defendants, and

THE STATE OF WISCONSIN, and
THE STATE OF OKLAHOMA,
Defendants-Intervenors.

----------X

CITY OF ATLANTA, and
MAYNARD JACKSON, Individually
and as Mayor, City of Atlanta,

Plaintiffs,

-against- 92 CIV 1566

RONALD H. BROWN, as Secretary of
United States Department of Commerce,
BUREAU OF THE CENSUS, and
BARBARA EVERITT BRYANT, as Director
of the Bureau of the Census,

Defendants.

----------X

FLORIDA HOUSE OF REPRESENTATIVES,
FLORIDA STATE CONFERENCE,
THE NATIONAL ASSOCIATION FOR THE
ADVANCEMENT OF COLORED PEOPLE,
MIGUEL A. DE GRANDY,

WILLYE DENNIS,
MARIO DIAZ-BALART,
Dr. CHARLES EVANS,
RODOLFO GARCIA, JR.,
BOLLEY L. "BO" JOHNSON,
ALFRED J. LAWSON, JR.,
WILLIS LOGAN, JR.,
JOHNNIE MCMILLIAN,
ALZO J. REDDICK,
PETER RUDY WALLACE,
T.K. WETHERELL,

Plaintiffs,

-against- 92 CIV 2037

RONALD H. BROWN, as Secretary of the United States Department of Commerce,
MICHAEL ESPY, as Secretary of Agriculture,
DONNA E. SHALALA, as Secretary of Health and Human Services,
HENRY CISNEROS, as Secretary of Housing and Urban Development,
ROBERT B. REICH, as Secretary of Labor,
FREDERICO PENA, as Secretary of Transportation,
RICHARD W. RILEY, as Secretary of Education, and
MICHAEL R. DARBY, as Under Secretary for Economic Affairs of

the United States Department of Commerce,

Defendants.

----------X

MEMORANDUM AND ORDER

McLAUGHLIN, Circuit Judge*.

Plaintiffs--states, cities, citizens' groups, and individual citizens and taxpayers--seek a judgment: (1) vacating former Secretary of Commerce Robert Mosbacher's July 15, 1991 decision that the 1990 census would not be statistically adjusted; (2) ordering that such an adjustment be made; and (3) allowing plaintiffs to use and publicize certain data generated by the Census Bureau, and already produced, subject to a protective order, to the plaintiffs during this litigation. For the reasons set forth below, the Court holds that the decision against adjustment shall not be disturbed, but grants the plaintiffs' request to use and publish the Census Bureau data. The following constitute the Court's findings of fact and conclusions of law in accordance with Federal Rule of Civil Procedure 52.

FACTS

Just to recount the facts of this case is arduous, given its four-year history, the number of parties involved, and the complicated statistical evidence lying at the core of the dispute. Many of the material facts have been set forth in two prior published opinions--*City of New York v. United States Dep't of Commerce*, 713 F.Supp. 48 (E.D.N.Y.1989)

---

*sitting by designation

("*City of New York I*"), and *City of New York v. United States Dep't of Commerce*, 739 F.Supp. 761 (E.D.N.Y.1990) ("*City of New York II*") --some familiarity with which is assumed.

Census Background

The Constitution requires a decennial census. Article I, Section 2, Clause 3 states that "[t]he actual enumeration shall be made [every ten years], in such manner as [the Congress] shall by Law direct." Congress has, in turn, delegated to the Secretary of Commerce the duty of taking the census "in such form and content as he may determine, including the use of sampling procedures and special surveys." 13 U.S.C. § 141(a) (1982). The Bureau of the Census, an agency within the Department of Commerce, actually conducts the census. *See* 13 U.S.C. § 2 (1982).

The results of the census are used for a galaxy of purposes. The federal government uses them to calculate how to dispense program funds among the states. States use the counts for political redistricting. Sociologists and historians study them for more esoteric purposes. None of this obscures the central truth that the "basic constitutional purpose" of the census is "to determine the apportionment of Representatives among the States." *Carey v. Klutznick*, 653 F.2d 732, 736 (2d Cir.1981).

The first census of the American population was in 1790. Thomas Jefferson, who was in charge of it, complained of an undercount. There have been 20 subsequent censuses. Each of them has also resulted in an undercount. More troubling than the undercount itself, however, is that racial and ethnic minorities are

undercounted to a greater degree than the population as a whole. This problem, known antiseptically as the "differential undercount," has skewed every census since the Bureau started measuring it in 1940.

Because the counts are used to calculate the political representation and financial aid to be afforded to a given area, the fear that the census may be perpetuating a system in which those most in need of representation and aid are deprived of both is a major concern. With that in mind, the Census Bureau began, after the 1980 census, to develop a method by which both the undercount of the entire population and the differential undercount could be reduced through a statistical adjustment employing a "post-enumeration survey" ("PES"). This method (and the Department of Commerce's reaction to it) lie at the heart of this case.

The 1990 Census

Taking the census has always been a daunting task, and the 1990 count was no exception. The Bureau began preparing in 1983, seeking to improve the techniques that it had used in prior censuses. Among other things, it consulted with state and local governments, planned an extensive advertising campaign, designed a more ethnically inclusive census questionnaire, and increased the amount of automation used, including the use of an automated geographic control system, which assured accurate and timely maps and geographic files for the 1990 census. While the parties may disagree on the quality of the census counts achieved in 1990, the four-step procedure used to conduct the census is largely undisputed.

First: an address list of housing units was compiled. This list was crucial because it indicated every household in the nation to which the Bureau would send questionnaires. Since the Bureau relies on the mail return of those questionnaires to count a majority of the population, an accurate and comprehensive list was vitally important. In constructing the list, the Bureau relied primarily on commercial mailing lists, supplemented by extensive field research and collaboration with the Postal Service. Then, numerous quality controls were instituted to improve the accuracy of the list.

Second: census questionnaires were mailed to each housing unit. Householders were asked to complete and return the questionnaires to the local census district office on or before April 1, 1990.[1] This is called the "mail out/mail back" phase. The effort to get individuals to participate in the mail out/mail back phase was extensive. In addition to the Census Bureau's general advertising campaign, it also conducted campaigns specifically targeted at African-Americans, Asians, Hispanics, and Native Americans. In addition, the Bureau published specialized, foreign-language brochures encouraging public participation in the census. It also maintained a set of toll-free numbers (in eight languages) for anyone who had questions regarding the census questionnaire, and every census form advised Spanish speakers that they could call a toll-free 800 number to obtain a census form in Spanish. Finally, the Census Bureau employed different methods in areas where it was believed that the normal procedure would be particularly ineffective. *See* Secretary of the Department of Commerce,

---

[1]April 1, 1990 day is officially entitled "Census Day," and is the precise date as of which the Census Bureau seeks to count the population.

Decision on Whether or Not a Statistical Adjustment of the 1990 Decennial Census of Population Should be Made for Coverage Deficiencies Resulting in an Overcount or Undercount of the Population, July 15, 1991 (the "*Decision*"), at 4-5-4-6.

Third: because the return rate of census questionnaires is obviously never 100%, and in 1990 was only 63%, *see* Transcript of Trial ("Tr.") at 1823, the Census Bureau embarked on an extensive follow-up campaign. Second mailings were sent to households that failed to return the initial form, and in census districts with particularly low return rates, the Bureau remailed census forms to all residents. Tr. at 1730-31.

Fourth: when steps 1-3 did not produce a census return from a particular household, the Census Bureau engaged in "non-response follow-up," the final stage of the enumeration. During this phase, each non-responding housing unit was assigned to a "census enumerator," an employee who was directed to make up to six attempts to contact a household member to obtain the information necessary to complete a census form. If this also proved fruitless, the enumerator was then required to try to obtain basic information on the missing housing unit from a reliable source, such as a neighbor or building manager. *Decision* at 4-7. Once 95% of a district's operations were completed, a final phase of non-response follow-up required enumerators to make one last-ditch attempt to visit each remaining unresolved household to obtain as complete an interview as possible.

After the enumeration was completed, post-enumeration "Coverage Improvement Programs"[2] were implemented, with the result that 5.4 million people were added to the counts. *Decision* at 4-7. The result of all of these efforts was that 249,632,692 people were counted during the 1990 census. *Decision* at 4-2.

The Differential Undercount

Despite the herculean efforts of the Census Bureau, it is undisputed that the 1990 Census was not--and could not realistically be--successful in its goal of achieving an exact count of the nation's population. Given the nature of the task, it is not surprising that the census fails to count some individuals ("omissions") and also adds persons into the count erroneously ("erroneous enumerations"). Tr. at 80-82.

The "net undercount" is the difference between omissions and erroneous enumerations. It is undisputed that the 1990 census, like all previous censuses, resulted in a net national undercount. *Decision* at 1-1. It is similarly uncontroverted that African-Americans and other minorities have been persistently undercounted to a greater degree than

---

[2]These coverage improvement programs included: (1) a 100 percent re-check of vacant, uninhabitable, or nonexistent units; (2) the "Were you counted?" advertising campaign to reach people who thought they might have been missed by the census; (3) a parolee and probationer check, to set the names and Census Day addresses of those people and add them to the census if they had not already been counted; (4) the housing coverage check, in which the Census Bureau recanvassed select blocks based on evidence flushed out by the automated management information system; and (5) the local government review program, which provided local governments with the opportunity to challenge census counts for their areas. *Decision* at 4-7-4-9.

non-Hispanic whites in all censuses since 1940 when the Bureau began measuring such differences, and that this anomaly is perpetuated in the 1990 census. The difference between the undercount rate for non-Hispanic whites and that for minority populations is known as the "differential undercount." Tr. at 91-92. According to the Secretary, "Blacks appear to have been undercounted in the 1990 census by 4.8%, Hispanics by 5.2%, Asian-Pacific Islanders by 3.1%, and American Indians by 5.0%, while non-Blacks appear to have been undercounted by 1.7%." *Decision* at 1-1.

The Possibility of Statistical Adjustment

The Census Bureau has been aware of the existence of a differential undercount since the 1950's. The intractable problem has been how to fix it. Following the 1980 census, concerns over the persistence of the differential undercount, its deleterious effects on the accuracy of census counts, and the unfair results arising from such inaccuracy, prompted the Bureau to start a research program aimed at developing statistical techniques to ameliorate the problem in the 1990 census.[3] Tr. at 525, 1291-92. By 1984, the Bureau had developed a timetable for internal Bureau research that would ultimately lead to a decision whether to adjust the 1990 census statistically in an effort to reduce the differential

---

[3]Discomfiture over the persistent pattern of differential undercount had prompted the Bureau to conduct a Post-Enumeration Program (the "PEP") in 1980, a survey designed to evaluate the quality of the 1980 census and to estimate the undercount, including the differential undercount, at both national and subnational levels. A lawsuit to have the 1980 census adjusted statistically by use of the PEP or another statistical technique was unsuccessful. *See Cuomo v. Baldrige*, 674 F.Supp. 1089 (S.D.N.Y.1987).

undercount. Two task forces were created to consider the undercount problem as it related to the upcoming 1990 census: The Undercount Steering Committee ("USC") was responsible for planning undercount research and policy development. The Undercount Research Staff ("URS") conducted the actual research. Other divisions at the Bureau also conducted research on the undercount and the possibility of adjustment. Tr. at 517-25, 1292-93. In addition, the Bureau sought the opinions of outside experts and organizations, such as the American Statistical Association and the National Academy of Science, regarding the possibilities for adjustment.

After considering the alternatives, the Bureau settled upon the PES as the best tool to statistically adjust the census through the use of "dual system estimation" ("DSE"). Tr. at 559-61. Dual system estimation or, in more pedestrian terms, "capture/recapture," is, as relevant here, an approach that uses a second measurement to ascertain the quality of the estimate obtained by an initial measurement, and then uses that information to provide a purportedly more accurate, dual system estimate.[4] Here, the original enumeration, the census, was followed by a second measurement, the PES, which attempted to measure the rate at which people were omitted and erroneously enumerated by the census, in order to determine a net undercount rate.

---

[4]At trial, the parties explained capture/recapture in terms of determining the number of fish in a lake. First you capture 1000 fish, tag them and throw them back. Then, you catch another 100. If 90 of those have tags, it suggests that 90 percent of all the fish in the lake are tagged. If so, then the 1000 fish initially tagged represent 90% of all the fish in the lake. Doing the algebra, the total population of fish in the lake is therefore 1,111. Tr. at 41-42.

While the Bureau has used post-enumeration surveys in a variety of ways since 1950, it has never statistically adjusted based on DSE. The Bureau worked throughout the 1980's to design the PES to make it an effective tool for census adjustment. Tr. at 572. For example, correlation bias, which may occur when residents become confused by an overlap between the census and the PES, was addressed by distinctly separating the two procedures. Tr. at 578-82. Another species of correlation bias, which arises when individuals who have different probabilities of being counted ("capture probabilities") in the census are grouped together in the PES, was reduced by the use of "poststratification." Tr. at 205-208.[5] In addition, statistical "smoothing" was chosen to address anomalous results in the PES.[6]

By the Spring of 1987, after much testing and fine-tuning, the Census Director, John Keane, had decided that the Bureau should proceed with plans to adjust the 1990 census data through the use of DSE, if the PES results met a certain quality standard. Dr. Keane met with his superior, Robert Ortner, the Under Secretary of the Department of Commerce, to tell him that such a decision had been made and that a press conference to that effect was imminent. Six days later, Keane met again with Ortner and other

---

[5]Poststratification grouped all individuals with a similar likelihood of being counted in the census. These groups, labeled "poststrata", were defined by age, sex, race, Hispanic origin, housing tenure (*i.e.* whether the individual owned or rented a residence), type of place (*i.e.*, central city, suburb, outside metropolitan area), and geographic region. Tr. at 513. This categorization resulted in a total of 1,392 exhaustive and mutually exclusive poststrata. Tr. at 206-07. In other words, each resident of the United States fits into one, and only one, poststratum.

[6]For an explanation of smoothing, see *infra* note 10.

Commerce Department officials, who informed Keane that *they* had decided against adjustment. Shortly thereafter, Commerce Department officials instructed their Census Bureau officials not to disclose that a decision had been made. Tr. 629-30, 1330. On October 30, 1987 the Department of Commerce announced its decision against adjustment, and this lawsuit was born.

History of This Litigation

In November, 1988, plaintiffs sued to enjoin the 1990 census, challenging the methodology by which it would be taken, and seeking to reverse the decision against adjustment. Defendants--the Department of Commerce, its Secretary, President Bush, and other officials within the Department of Commerce and its subsidiary, the Bureau of the Census--moved to dismiss the application for the injunction. This Court denied the dismissal motion, holding that the plaintiffs had standing to challenge the census on

constitutional grounds;[7] the Court also ruled that it would consider the Commerce Department's decision against adjustment under the "arbitrary and capricious" standard of review of the Administrative Procedure Act, 5 U.S.C. § 706(2)(A) (1982) (the "APA"). *City of New York I*, 713 F.Supp. at 54.

When the dismissal motion was denied, a hearing was scheduled on the injunction. It was set to go forward in the Summer of 1989, when, at the eleventh hour, the parties entered into a stipulation (the "Stipulation" or the "Stip."). The Stipulation vacated the Commerce Department's 1987 decision against adjustment and agreed that the new Commerce Secretary, Robert Mosbacher, would consider *de novo* and "with an open mind," whether adjustment was warranted. Stip. at 2-3. The Stipulation also agreed that the program to gather the statistical data necessary for adjustment would proceed, that the Secretary would decide whether to adjust by July 15, 1991, and that his decision would be consistent with certain procedures, including the promulgation of "guidelines" articulating what the defendants believed to be the relevant technical and policy considerations affecting the decision. It also mandated the creation of an eight-member Special Advisory Panel (the

---

[7]While the defendants continued to argue during pretrial proceedings that this case presented a non-justiciable political question, the Supreme Court has now rejected this argument, holding that constitutional challenges to the census methods employed to arrive at the apportionment are justiciable. *United States Dep't of Commerce v. Montana*, ___ U.S. ____, ____, 112 S.Ct. 1415, 1424-26, 118 L.Ed.2d 87 (1992).

"Panel")[8] of statistical and demographic experts to advise the Secretary on whether to adjust. Stip. at 4-5.

The defendants adopted and promulgated the required guidelines, but the plaintiffs challenged them as inadequate, and they also sought a declaratory judgment that a statistical adjustment would not violate the Constitution or any federal statute. Defendants countered that the plaintiffs' challenge to the census presented a non-justiciable political question. This Court rejected the defendants' political question claim, and concluded that statistical adjustment, per se, would not violate either the Constitution or the laws of the United States. *City of New York II*, 739 F.Supp. at 767-68. This Court noted that, while the guidelines were vague, they did satisfy, albeit just barely, the defendants' obligations under the Stipulation. *Id.* at 770.

The Post-Enumeration Survey

Following this Court's decision in *City of New York I*, the Bureau resumed work on its plans to implement the PES, and implemented it in 1990. In the first step of the

---

[8]By agreement, the Secretary chose four members of the Panel from a list of seven candidates submitted by the plaintiffs, and chose the four remaining Panel members himself. The Stipulation required the Panel members to be "of such knowledge, judgment and probity that their judgment and advice shall be entitled to the utmost respect by defendants." Stip. at 5. The four panel members chosen from the plaintiffs' list were Eugene P. Ericksen, Leobardo F. Estrada, John W. Tukey, and Kirk M. Wolter. The four panel members chosen unilaterally by the Secretary were William Kruskal, Michael McGeehee, V. Lance Tarrance Jr. and Kenneth M. Wachter. As required by the Stipulation, the Panel members submitted recommendations to the Secretary regarding the decision on whether to adjust. Stip. at 5.

PES, the Bureau methodically selected approximately 5000 blocks[9] in an effort to attain an appropriate sample size for each poststratum. In February 1990, Bureau employees visited each sample block and listed all the housing units they found, identifying approximately 170,000 households. In July 1990, Census Bureau interviewers returned to each address to obtain information regarding the residency status of those households on Census Day. The Bureau found that those blocks contained approximately 400,000 people. Tr. at 208. After collecting the PES data, the Bureau matched it to the information collected in the original enumeration for those same sample blocks. From this matching, the Bureau endeavored to estimate, for each poststratum, rates of omission and erroneous enumeration, and from these calculated a net undercount rate for each poststratum. Tr. at 221.

The Bureau used these results to develop an "adjustment factor" for each poststratum, *i.e.*, the number by which the population count as indicated by the census had to be multiplied so that the entire census would reflect the variations found in the PES. Accordingly, the 1,392 poststrata resulted in 1,392 corresponding adjustment factors. One further statistical twist to the use of the PES was the

---

[9]As used here, "block" means a square block; that is, all the buildings on four streets forming a square. Tr. at 209. The Census Bureau made a list of the more than 5,000,000 blocks in the United States and then selected approximately 5,000 that they believed fairly contained representative samples of the 1,392 poststrata. Tr. at 208; *Decision* at 4-11-4-12.

employment of "smoothing."[10] After smoothing, the Bureau used the smoothed adjustment factors to produce adjusted counts down to the block level, which were then aggregated to provide population estimates for cities, counties, states, and the nation. Tr. at 224-25; *Decision* at 4-18.

A number of quality control checks were made to test the results of the PES. First, the Bureau conducted or commissioned more than twenty formal research projects, called "P-Studies," to study the potential sources of error within the PES. The results of these P-Studies regarding

---

[10]Smoothing is a statistical procedure used to reduce the effects of sampling error. More particularly, it seeks to reduce the difference between the results from the PES sample and the results one would receive if one were able to survey the entire population. Smoothing in the 1990 census took place as follows. First, the 1,392 raw adjustment factors with corresponding raw variances (measures of sampling error) were compiled. The Bureau then employed pre-smoothing, or "modelling the variance," in an attempt to improve the accuracy of the estimates of the variances of the raw adjustment factors. Tr. at 796. Once modelling the variance was completed for each raw adjustment factor, a regression was performed. This regression moved the raw adjustment factor for each poststratum towards a typical value by an amount depending on the sampling error associated with that particular poststratum. Thus, where a particular raw adjustment factor had a small variance (*i.e.*, where the sample was very large), it would be moved only a small amount, whereas raw adjustment factors with larger variances tended to be moved more. Carrier variables relating to raw adjustment factors were selected in an effort to give the best estimate of the typical value. Tr. 807. These carrier variables included the same characteristics that defined the post-strata, such as age, sex, race, owner/renter, and other characteristics such as mail return rate. The end result is that the 1,392 raw adjustment factors became 1,392 smoothed adjusted factors. The census count for each postratum group was then multiplied by its smoothed adjustment factor and adjusted census counts were produced. Tr. at 788-89; *Decision* at 4-17-4-18.

particular sources of error were then combined in the "total error model" that summarized the overall quality of the PES data. Tr. at 652-59.[11]

The final result of the PES was that the census enumeration was estimated to have undercounted the population by 5,269,917, or 2.07%. In terms of the differential undercount, the PES indicated that the census undercounted Hispanics by 5.2%, African-Americans by 4.8% and Asian/Pacific Islanders by 3.1%. The PES-calculated undercount for non-African-Americans was 1.7% and 1.2% for non-Hispanic whites, with a total national undercount of 2.1%.[12]

The Bureau also conducted a number of "loss function analyses" to compare the quality of enumeration counts to the adjusted counts. A loss function analysis is a systematic way of assessing the consequences flowing from a particular decision. In the context of the adjustment decision, the Bureau used loss function analysis to determine whether the adjusted data were expected to be more accurate

---

[11]The major potential sources of error arising from the PES included: missing data, poor quality of the reported Census Day address list, fabrication, matching error, measurement of erroneous enumerations, balancing the estimates of gross overcount and gross undercount, correlation bias, small area estimation, and late census data. Tr. at 570-73.

[12]A recent "discovery of computer errors and some statistical changes have reduced the estimates of an undercount to 1.6 percent, about the same as in 1980." Felicity Barringer, *U.S. Population Passes 265 Million, Bureau Says*, N.Y. Times, December 30, 1992, at A12. As one of the witnesses testified here, "statistics is never having to say you're certain." Tr. at 1922.

than the unadjusted data. Tr. at 1941-42. This Court is satisfied that for most purposes the PES resulted in a more accurate--or to be statistically fashionable, a less inaccurate--count than the original census.

The Secretary's Decision and The Trial

Prior to reaching his decision, Secretary Mosbacher received the recommendations of the eight Panel members. Perhaps not surprisingly, the Panel was deadlocked: the four members selected from the plaintiffs' list recommended in favor of adjustment, while the four members chosen unilaterally by the Secretary recommended against it. *Decision* at 1-3. The USC voted 7-2 in favor of adjustment. *Id.* The Under Secretary of Commerce for Economic Affairs and the Administrator of the Economics and Statistics Administration voted against adjustment. Defendants' Exhibit 1 at 898. Finally, the Director of the Census, Dr. Barbara Bryant recommended in favor of adjustment, but acknowledged that "[t]here is no perfect truth as to the size and distribution of the population," and that "[a]djustment is an issue about which reasonable men and women and the best statisticians and demographers can disagree. The minority viewpoint expressed in the Census Bureau's report ... illustrates this." *Id.* at 1118-19.[13]

---

[13]Dr. Bryant's comments in a year-end interview are enlightening. *See Barringer, supra* note 12. In that interview "she said [that] while the statistical tools were available to make these adjustments for small geographical units, the necessary tools to double-check the findings were inadequate. In the face of legal scrutiny she said, this made a decision to adjust untenable." She is also quoted as stating that "'[e]very number has to become defensible,'" and "'[w]hen you say--you know how to do it but you can't prove its right or wrong--then it's no longer defensible. If it weren't for the problem that we had to defend it in court, there

On July 15, 1991, in accordance with the Stipulation, Secretary Mosbacher went on national television to announce his decision not to adjust. Simultaneously, he produced the *Decision*, a 178-page report giving the reasons for his decision. The decision revitalized the case and discovery resumed. Claiming that the Secretary's decision violated the Constitution, the APA, and the Stipulation, the plaintiffs requested a trial. More specifically, they alleged that the administrative record proffered by the Secretary as the basis of his decision is a self-serving, post-hoc compilation of documents assembled for the purpose of strengthening the defendants' litigation position and that the Secretary's decision was tainted by partisan political influence. Over the defendants' objection, this Court ordered a trial, which consisted almost exclusively of expert testimony in the fields of demographics and statistics, and continued for thirteen trial days.[14]

The expert witnesses expressed their opinions as to whether the Secretary considered all the factors specified in the guidelines in making his decision, and also analyzed at length the conclusions that the Secretary reached in the *Decision*. Plaintiffs' direct case consisted of the testimony

---

would have been a strong inclination to have adjusted....'"

Dr. Bryant also opined that she believed that an adjustment would have improved the accuracy of counts at " 'the national and state levels, the big levels,'" but that the PES results were "'very inconclusive' when used for smaller subdivisions of the population." *Id.*

[14]Before trial, two other cases presenting the identical issue in this case were transferred and consolidated with this action--*City of Atlanta v. Mosbacher*, 92-CV-1566; *Florida House of Representatives v. Franklin*, 92-CV-2037.

of nine witnesses, including all four of the plaintiffs' designees to the Panel. It also included the introduction of hundreds of exhibits and numerous deposition transcripts from other witnesses.

Defendants' evidence was similarly grand in scope. They presented five expert witnesses, including one Panel member. They also introduced the deposition transcripts of other witnesses and numerous exhibits. Of these, Exhibit 1, denominated as the Administrative Record by the defendants, and skeptically dubbed "the so-called Administrative Record" by the plaintiffs, contains over 12,000 documents and occupies 18,000 pages. The trial transcript exceeds 2,600 pages.

DISCUSSION

Plaintiffs allege that the Secretary's decision not to adjust the census count violates the APA, the Constitution, and the Stipulation.[15] They also argue that the process the

---

[15]Plaintiff Hudson County, New Jersey, also claims that the decision against adjustment violated the Voting Rights Act, which provides that:

> No voting qualification or prerequisite to voting or standard, practice, or procedure shall be imposed or applied *by any State or political subdivision* in a manner which results in a denial or abridgement of the right of any citizen of the United States to vote on account of race or color, or in contravention of the guarantees set forth in section 1973b(f)(2) of this title, as provided in subsection (b) of this section.

42 U.S.C. § 1973(a) (1982) (emphasis added). The Court rejects this claim because it is close to frivolous. By its plain language, the Voting Rights Act applies only to misconduct by states or their political subdivisions. *See Senate of California v. Mosbacher*, 968 F.2d 974, 979 (9th Cir.1992) (argument that Voting Rights Act contemplates suits

Secretary used to make his decision was a sham.[16] They seek an order directing the Secretary of Commerce to make the adjustment and they ask for permission to use Census Bureau data provided to them by the defendants during the course of this litigation under a protective order, and to release that data to the public.

I. The APA Standard of Review--Finality

The standard by which the Court reviews the Secretary's decision not to adjust should be stated at the threshold. At a previous stage in this litigation, this Court announced that "the arbitrary and capricious standard as set forth in § 706 of the APA will guide my review of the Secretary's determination." *City of New York I*, 713 F.Supp. at 54.

---

against the federal government is "severely flawed"); *Tucker v. United States Dep't of Commerce*, 958 F.2d 1411, 1414 (7th Cir.) ("The plaintiffs cannot be serious in arguing that the refusal to adjust the headcount violates the Voting Rights Act."), *cert. denied*, ___ U.S. ____, 113 S.Ct. 407, 121 L.Ed.2d 332 (1992).

[16]Plaintiffs assert that Secretary Mosbacher was closely aligned with the Republican Party and, therefore, never seriously considered adjustment in the belief that adjustment would favor Democratic politicians. They also argue that contacts made by then-White House Chief of Staff John Sununu and a member of his staff to Commerce Department officials other than Mr. Mosbacher tainted the decision. I have reviewed these allegations in detail. While it does appear that Mr. Sununu and his subordinates expressed their contempt for adjustment to Department of Commerce personnel, I cannot, on the record before me, conclude that such contacts represented improper influence. Moreover, the plaintiffs' attack on the integrity of Mr. Mosbacher--who was never a party to these conversations--does not warrant extended discussion here.

Defendants now contend that the plaintiffs' claim under the APA and, with it, this Court's decision to review the Secretary's decision under the arbitrary and capricious standard, have been vitiated by the Supreme Court's recent decision in *Franklin v. Massachusetts*, ___ U.S. ____, 112 S.Ct. 2767, 120 L.Ed.2d 636 (1992). There, Massachusetts challenged the Census Bureau's method for counting federal employees serving overseas, alleging that it was arbitrary and capricious, and, as such, a violation of the APA. Massachusetts also asserted that the method violated the constitutional requirements for conducting a decennial census and damaged it because it changed the congressional apportionment, moving one representative from Massachusetts to Washington. *Id.* at ____, 112 S.Ct. at 2770.

Refusing to address the APA claim, the Supreme Court concluded that the Secretary's determination was not "final" because, in the context of apportionment, the Secretary simply reports the results of the census to the President, who in turn transmits the apportionment for each state in the House of Representatives to the Clerk of the House. The Court reasoned that because "there is no statute that rules out an instruction by the President to the Secretary to reform the census, even after the data is [sic] submitted to him," the Secretary's decision as to how foreign federal employees are counted is "like the ruling of a subordinate official," and, therefore, not final for purposes of APA review. *Id.* at ____, 112 S.Ct. at 2774 (citation omitted).

Defendants believe that the same rationale that led the Supreme Court to reject the APA claim in *Franklin v. Massachusetts*, an apportionment case, applies with equal vigor here. I disagree. The Supreme Court held that the

Secretary's acts in conducting the census and reporting the counts to the President were not "final," for purposes of challenging *apportionment*. That case did not involve a situation where, as here, plaintiffs challenge the counts as they are used for intra-state *redistricting* and for *federal fund allocation*. *See City of New York I*, 713 F.Supp. at 50. Neither of these purposes requires the Secretary to transmit the counts to the President before publishing them or transmitting them to census data users.[17] The Secretary's reporting of the counts for those purposes, accordingly, is final agency action for purposes of APA review. As Justice Stevens explained in *Franklin*:

> Even in the Court's view, the Secretary's report of census information to recipients other than the President would certainly constitute "final agency action." The Court's decision thus appears to

---

[17]With respect to redistricting, 13 U.S.C. § 141(c) provides, in pertinent part, that:

> Tabulations of population for the areas identified in any plan approved by the Secretary shall be ... reported to the Governor of the State involved and to the officers or public bodies having responsibility for legislative apportionment or districting of such State....

Id. With respect to the plaintiffs' claim based on allocation of federal funds, the following statutes provide for direct reporting of census data by the Secretary of Commerce, without the President either acting as an intermediary or retaining final discretionary authority to report the counts: 42 U.S.C. § 9831 *et seq.* (Head Start program); 42 U.S.C. § 702 (Maternal and Child Health Services Block Grant); 42 U.S.C. § 5632 (Juvenile Justice and Delinquency Prevention Program); 42 U.S.C. §§ 3024, 3028(b) (Programs for Older Americans); 23 U.S.C. § 104(b)(6) (Highway Planning and Construction); 49 U.S.C.App. § 1607a (Urban Mass Transportation Capital and Operating Assistance programs).

> amount to a pleading requirement. To avoid the bar to APA review that the Court imposes today, litigants need only join their apportionment challenges to other census-related claims. Notwithstanding the Court's novel reading of the statute, in view of the Secretary's insistence on unitary census data, relief on any census claim would yield relief on all other claims.

Franklin, ___ U.S. at ____, n. 14, 112 S.Ct. at 2783, n. 14 (Stevens, J., concurring).

Accordingly, I adhere to my earlier decision that the APA governs the Secretary's decision. Hence, the question

for review is, as the plaintiffs have pithily stated, "whether the Secretary's application of the decision guidelines, as construed in light of constitutional requirements, to reject the [adjusted] counts is arbitrary and capricious."[18] Plaintiffs' Brief at 148.

II. The Constitutional Requirements

In *Franklin v. Massachusetts*, the Supreme Court reminded us that in making decisions regarding the census, "the Secretary's interpretation [of Art. I, § 2, cl. 3] [must be] consistent with the constitutional language and the constitutional goal of equal representation." ___ U.S. at ____, 112 S.Ct. at 2777. The language of the Constitution is beguilingly simple: "The actual enumeration shall be

---

[18]Plaintiffs also contend that the Secretary's decision was arbitrary and capricious independently of the Stipulation, because it conflicted with a Department Organization Order in which the Secretary delegated authority to conduct the Census to the Director of the Census Bureau. Department of Commerce Organization Order 35-2A, August 4, 1975, as updated July 24, 1987. I find this argument unpersuasive. While the Secretary did delegate his statutory duty to take the decennial census, he also required the Director of the Census Bureau to "report and be responsible to the Assistant Secretary for Economic Affairs," a position which subsequently became the Under Secretary for Economic Affairs. *Id.*; 15 U.S.C. § 1503a. The Secretary further directed the Under Secretary for Economic Affairs to "exercise policy direction and general supervision over ... the Bureau of the Census." Department of Commerce Organization Order 10-9, § 4.03, June 26, 1984. Thus, while delegating the operational responsibility necessary to prepare and conduct the census, the Commerce Department retained the authority to control policy direction, to exercise decision-making authority in significant Bureau matters, and to supervise the Bureau in the exercise of its census-taking task.

made ... in such manner as [the Congress] shall by Law direct."

While the defendants contend that the phrase "actual enumeration" bars adjustment, I have previously concluded "that because Article I, § 2 requires the census to be as accurate as practicable, the Constitution is not a bar to statistical adjustment." *City of New York II*, 739 F.Supp. at 767; *cf. Kirkpatrick v. Preisler*, 394 U.S. 526, 530, 89 S.Ct. 1225, 1228, 22 L.Ed.2d 519 (1969) ("[t]he whole thrust of the 'as nearly as practicable' approach is inconsistent with adoption of fixed numerical standards which excuse population variances"); *Wesberry v. Sanders*, 376 U.S. 1, 7-8, 84 S.Ct. 526, 530, 11 L.Ed.2d 481 (1964) ("as nearly as is practicable one man's vote in a congressional election is to be worth as much as another's").

The defendants also claim that judicial scrutiny of the Secretary's decision for accuracy is inappropriate after the Supreme Court's recent decision in *United States Dep't of Commerce v. Montana*, ___ U.S. ____, 112 S.Ct. 1415, 118 L.Ed.2d 87 (1992). In *Montana*, the state challenged a federal statute governing the method by which Representatives are allocated to the states because it resulted in giving Montana only one congressional seat, although its population was significantly higher than that of the average congressional district in the nation. The Court rejected the challenge, noting that "although common sense supports a test requiring a good faith effort to achieve precise mathematical equality *within* each State, the constraints imposed by Article I, § 2, itself make that goal illusory for the nation as a whole." *Id.* at ____, 112 S.Ct. at 1429 (emphasis in original) (citation omitted). The specific constraints making mathematical precision illusory on the

national level were "[t]he constitutional guarantee of a minimum of one Representative for each State," and "the need to allocate a fixed number of indivisible Representatives among 50 states of varying populations." *Id.*

I reject the government's argument that *Montana* mandates a departure from my earlier conclusion that the Secretary of Commerce must conduct the census in a manner to render it as accurate as practicable. First, the constitutional constraints that warranted departure from that standard in *Montana* are not present here. Second, in *Montana*, the Court noted that Art. I, § 8, cl. 18, of the Constitution "expressly authorizes Congress to enact legislation that 'shall be necessary and proper' to carry out its delegated responsibilities." *Id.* Here, no constitutional provision requires similar deference to the Secretary's decision. Finally, the *Montana* case involved a challenge to a census procedure only as it related to apportionment, not as it related to intra-state redistricting. Here, by contrast, the decision on whether to adjust the 1990 census had profound effects on intra-state redistricting because the adjusted counts would change not only national and state population figures, but the counts for political subdivisions within states, such as cities and counties. Because the implications of the Secretary's decision at issue here are fundamentally different from the federal statute at issue in *Montana*, I adhere to my earlier conclusion that the Secretary must assure that the census be as accurate as practicable.

The conclusion that the Secretary must provide the most accurate census practicable however, does not, lead inexorably to the conclusion that a decision against adjustment is therefore unconstitutional. In deciding whether

the Secretary's decision was arbitrary and capricious in light of the requirement that the decision provide the most accurate census practicable, the Court must turn to the Secretary's consideration of the guidelines, which help to illuminate the meaning of both "accuracy" and "practicability."

III. The Guidelines

An agency decision is arbitrary and capricious "if the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise." *Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43, 103 S.Ct. 2856, 2867, 77 L.Ed.2d 443 (1983). Here, the analytical scaffolding for review of the Secretary's decision is established by the guidelines promulgated in accordance with the Stipulation.[19]

The Stipulation provided that the Secretary retained all authority and decision-making power, "including without limitation the decision whether or not to adjust the 1990 Decennial Census." Stip. at 1. It also required the defendants to "develop and adopt guidelines articulating what defendants believe are the relevant technical and nontechnical statistical and policy grounds for decision on whether to

---

[19]A discussion of how the guidelines were formulated, considered, and ultimately promulgated may be found in the earlier opinion in which I rejected a challenge to their sufficiency. *City of New York II*, 739 F.Supp. at 769 & n. 9.

adjust the 1990 Decennial Census population courts." Stip. at 3. Accordingly, the defendants promulgated the following eight final guidelines to serve as the grid against which the Secretary's decision must be measured:

1. The Census shall be considered the most accurate count of the population of the United States, at the national, state, and local level, unless an adjusted count is shown to be more accurate. The criteria for accuracy shall follow accepted statistical practice and shall require the highest level of professional judgment from the Bureau of the Census. No statistical or inferential procedure may be used as a substitute for the Census. Such procedures may only be used as supplements to the Census.

2. The 1990 Census may be adjusted if the adjusted counts are consistent and complete across all jurisdictional levels: national, state, local, and census block. The resulting counts must be of sufficient quality and level of detail to be *usable* for Congressional reapportionment and legislative redistricting, and for all other purposes and at all levels for which census counts are published.

3. The 1990 Census may be adjusted if the estimates generated from the pre-specified procedures that will lead to an adjustment decision are shown to be more accurate than the census enumeration. In particular, these estimates must be shown to be robust to variations in reasonable alternatives to the production procedures, and to variations in the statistical models used to generate the adjusted figures.

4. The decision whether or not to adjust the 1990 Census should take into account the effects such a decision might have on future census efforts.

5. Any adjustment of the 1990 Census may not violate the United States Constitution or Federal statutes.

6. There will be a determination whether to adjust the 1990 Census when sufficient data are available, and when analysis of the data is complete enough to make such a determination. If sufficient data and analysis of the data are not available in time to publish adjusted counts by July 15, 1991, a determination will be made not to adjust the 1990 Census.

7. The decision whether or not to adjust the 1990 Census shall take into account the potential disruption of the process of the orderly transfer of political representation likely to be caused by either course of action.

8. The ability to articulate clearly the basis and implications of the decision whether or not to adjust shall be a factor in the decision. The *general rationale* for the decision will be clearly stated. The technical documentation lying behind the adjustment decision shall be in keeping with professional standards of the statistical community.

City of New York II, 739 F.Supp. at 769 (emphasis in original).

"Most of these guidelines are embroidered with an accompanying 'explanation.'" *Id.* The *Decision* discussed

each of the guidelines in detail, and concluded that numbers 1, 2, 3, 4 and 7 militated against an adjustment, while numbers 5, 6, and 8 did not tilt either way. The plaintiffs argue that the conclusions reached by the Secretary with respect to guidelines 1, 2, 3, 4 and 7 are the result of implausible assumptions, unwarranted speculation, and misuse, misstatement, and disregard of the evidence.

Guideline One

Guideline One, establishes the point of departure for analysis of the adjustment question. It mandates that the actual count be considered the most accurate count of the population "at the national state and local level, unless an adjusted count is shown to be more accurate."

To test the accuracy of the adjusted counts against the actual enumeration, the *Decision* referred to a population measurement technique that the Census Bureau had used, Demographic Analysis ("DA"). *Decision* at 2-9. DA estimates the population, and the subpopulations of particular groups, through administrative records such as birth and death certificates, and immigration statistics. *Id.* The Secretary conceded "that the PES and DA estimates are not far apart in a statistical sense," but found "some important and puzzling differences," which "lead to sharply different conclusions" and raise some "question" as to "whether the adjusted figures are more accurate than the census count even at the national level." *Id.* at 2-10, 2-35.

Among the specific problems that the Secretary noted were: (1) that the overall undercount rate inferred from comparing the actual enumeration to DA (1.85%) is smaller than that inferred from the PES (2.07%), a result contrary

to intuitive expectation;[20] (2) that, at the national level, there were instances where a PES-based adjustment would move sub-population totals in the opposite direction from that indicated by DA;[21] (3) that PES would add 1,055,826 more females than DA indicates should be added; and (4) "that all groups of black males (except those aged 10-19) are substantially undercounted by the PES relative to DA." *Decision* at 2-10.

In addition to a comparison with DA, the Secretary also discussed a number of other statistical techniques that were used to gauge the accuracy of the PES counts when compared to the census results. He conceded that the PES-adjusted estimates might reflect more accurately the total population, and the racial and ethnic subpopulations of the country, and that "[a]t the State and local level.... the adjusted figures tend to be too high, but generally closer in

---

[20]According to the Secretary, DA would normally be expected to reveal a higher undercount rate when compared to the Census than the PES would, because the PES and Census will both miss people who are difficult to survey, while DA, which relies solely on an examination of records, will not. *Decision* at 2-10.

[21]Some examples of this problem cited by the Secretary are:

> An adjustment based on the PES will *add* 180,318 non-black males aged 10-19, while the DA indicates 136,908 should be *deleted*--a difference in the wrong direction of 317,226.
> An adjustment based on the PES will *delete* 91,631 males over the age of 65, while DA indicates that 192,950 should be *added*--a difference in the wrong direction of 284,541 persons.
> An adjustment based on the PES will *delete* 245,253 females over the age of 45 while DA indicates 146,255 should be *added*--a difference of 391,508 persons in the wrong direction.

Decision at 2-12 (footnotes omitted).

numeric terms to the true population than the census counts which tend to be too low." *Id.* at 2-1. He concluded, however, that "[t]he loss function analysis and hypothesis tests that have been prepared by the Census Bureau to date, although of uncertain reliability, do support the superior accuracy of the census counts versus the adjusted figures when we consider distributive accuracy--or fairness--and use reasonable estimates of the error variance of the alternative [PES-based adjustment]." *Id.* at 2-2.

He also expressed concern that there was little or no direct evidence that the adjusted counts led to greater distributive accuracy at local levels. On that basis, the Secretary concluded that Guideline One militated against adjustment because "acceptance of adjusted counts as more accurate requires not only that the *counts themselves* be shown to be more accurate, but that the *distribution of those counts* across the United States reflect more accurately the distribution of the population." *Id.* at 2-8 (emphasis in original).

As support for these concerns, the Secretary discussed a Census Bureau loss function analysis that measured the number of individual states whose population would be made less accurate by adjustment than by using the census count. As conducted by the Bureau, the loss function indicated that 21 states' population shares would be made less accurate by adjustment. However, when the Secretary employed a statistical variance toward the low end of the acceptable range envisioned by the USC, he found that the proportional shares of 28 or 29 states would be worsened by adjustment. *Id.* at 2-30. The Secretary similarly expressed his trepidation that there was insufficient evidence to support

the greater distributive accuracy of the adjusted counts at the local level. *Id.*

In his consideration of Guideline One, the Secretary also expressed serious concern over the methodology by which the PES was taken, and the manner in which the adjusted counts were tabulated.[22] He was particularly discomfited by the manner in which unresolved cases in the PES were treated because the Bureau had to determine whether people found in the PES were also found in the census in order to compute dual system estimates for the poststrata. Such determinations were made by "matching" census forms to PES forms for the same household. A household survey in the PES that was "matched" to the census record of that residence meant that there was no error in the census enumeration of that household. A non-match meant an undercount. *Decision* at 2-16. Because there were cases where incomplete census and PES forms made such matching impossible, the Bureau was forced to employ a mathematical model to impute enough missing characteristics to enable it to make a match determination. Even after that imputation was complete, there were people found in the PES for whom it was impossible to determine whether they matched people counted in the census, and vice-versa. In those cases a different set of formulas was used to impute match status.

---

[22]Among other things, the Secretary was troubled by the effects that erroneous enumerations in the census, correlation basis, and failure in the PES total error model could have on the adjusted counts. *Id.* at 1-17-23. The proof at trial, however, has made it clear that these matters were peripheral to the Secretary's conclusion under Guideline One, and therefore do not merit significant discussion here.

The Secretary concluded that, "[i]n general, missing data were not found to be a serious problem," but identified several areas of concern with the imputation process. First, he noted that while the rates of imputation in the P and E samples[23] were low--1.7% and 2.1% respectively--weighted up to the national population they represented almost nine million people, a number almost twice as large as the net national undercount. *Decision* at 2-16. Second, in noting the high correlation between imputation ratios and undercount ratios, he stated that "the strata for which there is more doubt about the quality of the adjusted data because of imputation tend to be the same strata for which an adjustment would result in large increases in the population." *Id.* Finally, the Secretary noted that the assumptions in the imputation models were largely untested. *Decision* at 2-17. His concern was exacerbated by his respect for the research of Panel member Kenneth Wachter, which indicated that flaws in the imputation model could render the adjusted counts "significantly in error."

Based on all the foregoing, the Secretary concluded that there was simply not enough convincing evidence to support a finding that the adjusted counts would lead to greater distributive accuracy than the census counts, and therefore that the guideline "weigh[ed] in favor of a decision not to adjust." *Id.* at 2-36.

The plaintiffs assail this conclusion on several grounds. First, they argue that the Secretary misused DA

---

[23]In the jargon of the DSE, the "P sample" represented the group surveyed by the PES. The "E sample" represented the people living in the same household as the P sample as counted by the census. *Decision* at 4-12-4-13.

because that technique has historically been most accurate as a "yardstick of the census in terms of national undercount and as a measure of differential undercount between demographic groups," but "is much less reliable in its ability to estimate an undercount rate for a specific group in a particular census," as the Secretary attempted to use it. They contend that the Secretary's focus on discrepancies between PES and DA undercount rates for certain specific groups is an attempt to obfuscate the fact that, as the Secretary himself admits, the "detailed analysis shows that the PES and DA estimates are not far apart in a statistical sense." *Decision* at 2-10.

With respect to the Secretary's professed concern over distributive accuracy, the plaintiffs contend that the Secretary's invocation of a loss function that merely counted up the number of states whose populations would be made less accurate, regardless of the greater aggregate accuracy of the adjustment, and without reference to the extent that counts are made less accurate, is statistically insupportable. They also argue that the Secretary's rejection of numerous loss function analyses performed by the Bureau supporting the superior accuracy of the adjusted counts, and his putative concern with the technical aspects of the PES are irrational at best, and disingenuous at worst.

I have reviewed in some detail the Secretary's conclusion that Guideline One militated against adjustment and the plaintiffs' arguments to the contrary. While the plaintiffs have made a compelling attack on the *Decision*, and the Secretary has conceded that the objective criteria used to measure the adjusted counts show a greater numeric accuracy at the national level and that the Census Bureau estimates of distributive accuracy marginally favor the

adjusted counts, I find that Secretary's conclusion under Guideline One was neither arbitrary nor capricious.

The Secretary's decision to focus on distributive, rather than numeric, accuracy was consonant with the constitutional goal of assuring the most accurate census practicable, given the census's function as a standard by which to distribute political representation and economic benefits. In that regard, I find that the Secretary's use of a loss function that considered the number of states whose populations would be made less accurate by adjustment to be appropriate. Similarly, the Secretary's concern that "[w]ith respect to places under 100,000 population, there is no direct evidence that adjusted counts are more accurate" was legitimate, given Guideline One's requirement that the adjusted counts be shown to be more accurate at the local level. *Decision* at 2-30.

Plaintiffs' attack on the Secretary for subjecting the tests favoring adjustment to unrealistically rigorous scrutiny misconstrues Guideline One, which clearly states that "[t]he Census shall be considered the most accurate count of the population of the United States, at the national, state, *and local levels, unless an adjusted count is shown to be more accurate*." *City of New York II*, 739 F.Supp. at 769 (emphasis added). Thus, plaintiffs' failure to illustrate affirmatively the superior accuracy of the adjusted counts either (1) at any level mentioned in Guideline One, or (2) for any reasonable definition of accuracy, is sufficient to support a finding that Guideline One favors use of the original census counts.

Turning to the Secretary's focus on the mechanics of the PES and the use of imputation, I find this consideration

appropriate. Because the PES, like any sample survey,[24] rests on an assumption to begin with--that the portion sampled is identical to the population as a whole--placement of additional assumptions into the model caused by imputation is a fair basis for escalating skepticism. While the logic of the Secretary's conclusion regarding Guideline One is not overpowering, neither can it be characterized as arbitrary or capricious.

Guideline Two

Guideline Two states that adjustment may be made only if the adjusted counts are "consistent and complete across all jurisdictional levels: national, state, local and census block." The guideline also requires the adjusted counts to "be of sufficient quality and level of detail to be *usable* for ... all ... purposes and at all levels for which census counts are published." *City of New York II*, 739 F.Supp. at 769 (emphasis in original). The Secretary recognized that "[t]he adjusted figures ... are consistent across all jurisdictional levels and of sufficient detail for all purposes," but nevertheless concluded that Guideline Two militated against adjustment because of the questionable quality of the adjusted counts. *Decision* at 2-45.

In surmising that the counts were of debatable quality, the Secretary homed in on the "homogeneity assumption" in the construct of the 1,392 poststrata. He was troubled that the "adjustment process rests on the assumption that persons in each poststratum are homogeneous with respect to their probability of being missed by the census, *i.e.*, their capture probability." *Decision* at 2-39. Conceding

---

[24]See the discussion of capture/recapture in note 4, supra.

that many experts did not find this assumption problematic, and that at broad levels such as the national and state levels the assumption caused no serious problems, the Secretary ultimately concluded that "'local heterogeneity is a serious problem for adjusting the 1990 census'", and that "'[the] evidence indicates that a substantial portion, possibly a majority, of relative counts for district-size units can be made worse off by adjustment.'" *Decision* at 2-42 (quoting *Report of Special Advisory Panel Member Kenneth Wachter*, at 26).

In reaching this conclusion, the Secretary worried that because members of an individual poststratum might have a different likelihood of being undercounted, thereby debunking the homogeneity assumption, generalizing the undercount rate of those counted in the PES to all members of that poststratum might seriously interfere with the accuracy of the count for some census purposes, including redistricting. He discussed two studies conducted by the Bureau that addressed the homogeneity assumption, and which the Bureau had relied on in concluding that individuals within each poststratum were sufficiently uniform to warrant such an assumption, dubbed the "P12" and "P15" studies. *Decision* at 2-38-2-40. The Secretary opined that the Bureau's evidence from those studies was "mixed."

He was also concerned about the adverse consequences that a failure in the homogeneity assumption could have on adjustments at local levels, noting that because there were only 5000 sample blocks, most jurisdictions would be adjusted based on data gathered elsewhere. *Decision* at 2-43.

The plaintiffs brand the Secretary's concern about heterogeneity as "unreasonable." They assert that because perfect homogeneity is utterly unattainable in the world of survey sampling, the relevant question is whether a departure from the homogeneity assumption has an important impact on the measurement. They contend that because the pertinent Census Bureau studies supported the homogeneity assumption, and particularly because the P12 study confirmed that the population subgroups defined for the PES are sufficiently uniform to be usable for adjustment, there was sufficient homogeneity to warrant the conclusion that the adjusted counts lead to improvement.

Plaintiffs' argument is rejected. While they have made a strong showing that the adjusted counts are more accurate than the original counts for most purposes for which the census is used, the Secretary's concern that heterogeneity may lead to less accurate counts at local levels used for redistricting appears reasonable. Plaintiffs' contention that the Secretary was effectively required to bite the bullet and ignore the problem that residual heterogeneity posed, once the Bureau had concluded that there was sufficient evidence to support the homogeneity assumption, ignores the guidelines' mandate that the *Secretary* determine that the adjusted counts be usable for all purposes for which census counts are published. Clearly, there is some likelihood that residual heterogeneity will have an adverse effect on the census counts when used for redistricting. This is enough to support the Secretary's conclusion that Guideline Two militates against adjustment. Accordingly, I find that his conclusion was not arbitrary or capricious.

Guideline Three

Guideline Three requires that the PES and other adjustment procedures be "pre-specified" and that the estimates they generate be "shown to be robust to variations in reasonable alternatives to the production procedures, and to variations in the statistical models used to generate the adjusted figures." *City of New York II*, 739 F.Supp. at 769. The Secretary advanced two arguments as the basis for his conclusion that Guideline Three militated against adjustment: (1) that the actual conduct of the DSE did not proceed sufficiently in accordance with a pre-specified plan; and (2) that certain statistical techniques and assumptions were not sufficiently "robust" to support adjustment.[25] *Decision* at 2-54-2-55.

On the first point, the Secretary recounted various decisions that Bureau employees made after the pre-specification of the PES, including choices about the selection of carrier variables during the regression analysis in the smoothing process. *Decision* at 2-47. He noted that one member of the Panel who voted for adjustment had conceded that certain pre-specified procedures had changed during the enumeration process and had affected the PES. *Id.* (citing *Report of Panel Member Wolter*, pp. 9-10). The Secretary agreed with Wolter's ultimate conclusion that the decisions to change pre-specified procedures made during the enumeration and the PES were treated with a high degree of professionalism and also acknowledged that the PES could

---

[25]In the world of survey sampling, "robustness" describes the integrity and reasonableness of the results achieved by a particular statistical technique. Robustness is determined by exposing such statistical techniques to variations in the assumptions underlying them.

not have been completely pre-specified, but expressed his discomfort with the deviations as follows:

> Although I believe that the decisions [to deviate from pre-specified procedures] *were* made for sound professional reasons in the 1990 census, using these adjustment mechanisms opens the possibility for manipulation of future post enumeration surveys in ways that are unavailable in traditional census procedures. This weighs heavily against an adjustment of the census.

Decision at 2-48 (emphasis in original).

With respect to the robustness of the results when subjected to alternative statistical models required by Guideline Three, the Secretary concluded that "[t]he results of the adjustment procedure are broadly robust at an aggregate, national level." *Id.* at 2-54. However, he found three questionable areas where the adjustment methods concerned him: (1) imputation; (2) poststratification; and (3) the use of smoothing procedures.

The Secretary concluded that the imputation was statistically robust, but expressed a fear that variations of the assumptions underlying the imputation could have an effect on the apportionment of the House of Representatives. *Id.* at 2-48-2-49. With respect to poststratification, the Secretary observed that if poststratification had recognized the state of residence rather than the census division of residence as a factor, three states would have had significantly different counts. *Id.* at 2-49. Finally, moving to the robustness of smoothing, the Secretary concluded that the numerous decisions and techniques involved in the

two-stage process, including the discretionary selection of carrier variables, led to an impermissibly high level of uncertainty to employ the adjusted counts as a basis for reapportionment. *Id.* at 2-49-2-54. In short, the Secretary stated that the lack of comprehensive pre-specification, the possibility it raised for future political manipulation, and the uncertainty associated with the use of extensive statistical assumptions in the adjustment process led him to find that Guideline Three militated against adjustment.

In their attack on this conclusion, the plaintiffs first argue that the Secretary's concern over political manipulation of future censuses because of the lack of pre-specification is an inappropriate basis for making a determination under Guideline Three. While I tend to agree with that argument, I read the Secretary's discussion of future political manipulation as merely an explanatory note, underscoring why he thought that pre-specification was so significant. Because Guideline Three clearly mandated pre-specification, the Secretary's well-supported conclusion that the procedures were not adequately pre-specified supported his conclusion under this guideline.

Plaintiffs also argue that the Secretary required an impossible degree of pre-specification because some of the decisions to be made, including decisions relating to the smoothing process, were highly dependent on data to be collected during the PES, and therefore could not have been completely pre-specified. This argument ignores the fact that certain techniques were pre-specified and then changed later. *See Report of Special Advisory Panel Member Kirk M. Wolter* at 10. The Secretary's conclusion that pre-specification did not occur as contemplated by the guideline was justified.

Plaintiffs also belittle the Secretary's concern that even small changes in any of the assumptions underlying the statistical procedures of the adjustment could lead to a different apportionment of the House of Representatives. Deprecating his conclusion that this seriously compromised use of the adjusted counts, they contend that because the Secretary has conceded that small changes in the *census* methodology can move House seats as readily as small changes in the PES methodology, his concern under Guideline Three is illusory.

I disagree. The plaintiffs' reliance on the imperfections in the census to blink at similar uncertainties in the adjustment procedure misses the point that, under the rubric of the guidelines, the adjusted counts must satisfy certain criteria, regardless of whether the original enumeration could survive exposure to similar criteria. It must be remembered that under Guideline One, the presumption of accuracy runs in favor of the original census count. Because the Secretary's concerns over pre-specification and the robustness of adjustment data were legitimate, I find that the Secretary's conclusion under Guideline Three was not arbitrary or capricious.

Guideline Four

Guideline Four counsels that "[t]he decision whether or not to adjust the 1990 Census should take into account the effects such a decision might have on future census efforts." *City of New York II*, 739 F.Supp. at 769. With this in mind, the Secretary stated that he "d[id] not find compelling evidence in either direction regarding the effects of a decision on future individual motivations." *Decision* at 2-58. Weighing the effects that an adjustment might have on the

efforts of state, community, civic, and interest group leaders, the Secretary was concerned that "an adjustment [would] remove the incentive that these public officials and groups currently have to provide active support in achieving a complete count." *Id.* at 2-59. The Secretary found "unpersuasive" the contention that, even with an adjustment, local officials would retain a strong incentive to gather data, and "[found] no evidence indicating that local support would decrease as a result of a decision not to adjust the census." *Decision* at 2-59.

He went on to conclude that a decision to adjust could hinder the operations of the census in other ways, including disincentives for Congress to provide funding, and for enumerators to pursue their task energetically, and the possibility that adjustment could be distorted for partisan political purposes in future censuses. *Id.* at 2-60. Balancing all these fears, the Secretary concluded "that an adjustment would adversely affect future census efforts to a greater extent than any adverse effects of a decision not to adjust." *Id.* at 2-61.

Plaintiffs argue that it is futile to fret over censuses in the year 2000 and beyond in considering whether or not to adjust the 1990 census. This argument blithely ignores the express mandate of Guideline Four that the effect of the Secretary's decision on future censuses be considered. While I recognize that Guideline Four creates a potential tension with the constitutional requirement that the census be as accurate as practicable, under the circumstances of this case, that tension is minimal. Accordingly, I find that the Secretary's conclusion regarding Guideline Four was neither arbitrary nor capricious.

Guidelines Five & Six

Because the Secretary's conclusions based on Guidelines Five and Six are not challenged by the plaintiffs, I will only say that the conclusions reached by the Secretary in the Decision sufficiently considered those guidelines.[26]

Guideline Seven

Guideline Seven provides that "[t]he decision whether or not to adjust the 1990 Census shall take into account the potential disruption of the process of the orderly transfer of political representation likely to be caused by either course of action." *City of New York II*, 739 F.Supp. at 769. At an earlier stage of this litigation, I rejected a request to vacate Guideline Seven, finding that it, and Guideline Eight, might, "in a constructive fashion, help define the meaning of 'the most accurate census practicable,'" and concluded that, at least to that extent, they were permissible factors. *Id.* at 771.

In his consideration of Guideline Seven, the Secretary noted that the Clerk of the United States House of

---

[26]Guideline Five provides that adjustment cannot violate the Constitution or any federal statute. The Secretary concluded that because he had reached a decision not to adjust based on other factors, "legal considerations did not provide a basis" for his decision. *Decision* at 2-65.

Guideline Six mandates that if adjusted counts could not be published by July 15, 1991, a determination would be made against adjustment. Although adjusted counts were ready to be published by July 15, 1991, the Secretary had concluded not to adjust, and so this guideline became moot.

Representatives had officially certified to each of the fifty states the number of seats allotted to that state for the 103rd Congress (convened in January 1993) based on census figures released on December 26, 1990, and that, as of May 1991, "some 20 states had already enacted either or both of their Congressional and State legislative redistricting plans." *Decision* at 2-71. The Secretary then went on to outline the disruption and delay that an adjustment would cause, particularly in those states where adjustment would change their allotted number of seats in the House of Representatives.

It should be remembered that Congress decreed in 1912 there be only 435 seats in the House of Representatives. We are, therefore, dealing with a zero-sum game; when one state gains a seat, another must lose one. If the adjustment were made, California and Arizona, for example, would each gain one seat in the House, while Pennsylvania and Wisconsin would each lose one. *Id.* at 2-72. The Secretary envisioned massive litigation over such a decision.

Ultimately, the Secretary concluded that Guideline Seven favored adherence to the census counts. He rejected the argument that non-adjustment is "inherently disruptive," as based on the question-begging premise that the adjusted counts are more accurate. He also concluded that, even if it were true that adjustment would result in a fairer distribution of funds, this consideration would pale in comparison to the disruption of political representation that would ensue from a decision to adjust, because "adjustment would not result in significant shifts in those funds." *Id.* at 2-75.

Plaintiffs assail the Secretary's Guideline Seven conclusion on two distinct grounds. First, they suggest that it is disingenuous for the Secretary to rely on the fact that the unadjusted counts were already being used for reapportionment and redistricting purposes, when the Stipulation required that any release of the unadjusted data before the Secretary's decision be accompanied by a notice advising recipients that they used the data at their own risk. None of this however, detracts from the fact that Guideline Seven explicitly required the Secretary to consider such disruption in deciding whether or not to adjust. Nor does it contradict the simple logic of the Secretary's argument that a decision in favor of adjustment on July 15, 1991, would have disrupted the reapportionment and redistricting that was then ongoing.

Plaintiffs also observe that the Secretary's conclusion that adjustment would not result in significant shifts in federal funds contradicts an earlier sentence in the *Decision* that city and state population "shares are very important because they determine ... how large a 'slice of the pie' of federal funds go to each city and state." *Decision* at 1-3-1-4. Plaintiffs are right. This, however, does not render the Secretary's decision invalid under Guideline Seven, because it involves a matter--the allocation of federal funds--only tangentially related to Guideline Seven, the basic thrust of which is the effect of a decision to adjust "on the orderly transfer of political representation." Accordingly, while there is an obvious inconsistency in the discussion accompanying the result, the plaintiffs have failed to show that the Secretary's conclusion under Guideline Seven was arbitrary or capricious.

Guideline Eight

Guideline Eight requires the Secretary to articulate the factors relied upon in reaching his decision, and also requires that "[t]he technical documentation lying behind [his] decision shall be in keeping with professional standards of the statistical community." *City of New York II*, 739 F.Supp. at 769. Because the plaintiffs do not specifically attack the Secretary's decision under this guideline, and because the Secretary concluded that application of this guideline neither favored nor militated against adjustment, I find that the Secretary's Decision complied with Guideline Eight.

* * *

Having thus parsed the guidelines, the Court concludes that the Secretary's conclusions under each guideline and his ultimate decision against adjustment cannot be characterized as arbitrary or capricious. The breadth of the guidelines left the Secretary enormous discretion. Plaintiffs have made a powerful case that discretion would have been more wisely employed in favor of adjustment. Indeed, were this Court called upon to decide this issue *de novo*, I would probably have ordered the adjustment.[27] However, it is not within my province to make such determinations. The question is whether the Secretary's decision not to adjust is so beyond the pale of reason as to be arbitrary or capricious. That far I cannot go.

---

[27]Additionally, I note that in light of recent improvement in statistical tools and the practical benefits that the 1990 PES has provided, the use of adjustment in the next census is probably inevitable.

One of the central tenets of our founding fathers was that the role of the judiciary should be carefully delineated, especially when the controversy related to the management of the government. As Hamilton wrote:

> The administration of government, in its largest sense, comprehends all the operations of the body politic, whether legislative, executive, or judiciary; but in its most usual and perhaps in its most precise signification, it is limited to executive details, and falls peculiarly within the province of the executive department.

The Federalist No. 72 at 450 (Henry Cabot Lodge, ed., 1888).

The writings of Montesquieu and Locke bristle with the notion of separation of powers. But nowhere is it articulated more succinctly than in the Massachusetts Constitution:

> In the government of this commonwealth, the legislative department shall never exercise the executive and judicial powers, or either of them: the executive shall never exercise the legislative and judicial powers, or either of them: the judicial shall never exercise the legislative and executive powers, or either of them: to the end it may be a government of laws and not of men.

Mass. Const. pt. 1, art. 30 (1780).

True, the APA sanctions judicial intervention when the parties feel aggrieved by a final administrative ruling.

But the APA tightly cabins judicial oversight, permitting judicial intrusion only when the administrative decision abuses reason. It is essential to the maintenance of judicial integrity that courts reviewing such determinations zealously adhere to the arbitrary and capricious standard of review. *Citizens to Preserve Overton Park, Inc. v. Volpe*, 401 U.S. 402, 416, 91 S.Ct. 814, 824, 28 L.Ed.2d 136 (1971) (When reviewing agency action under the arbitrary and capricious standard of review, "the ultimate standard of review is a narrow one. The court is not empowered to substitute its judgment for that of the agency."); *Hudson Transit Lines v. United States ICC*, 765 F.2d 329, 336 (2d Cir.1985) ("while a reviewing court may not supply the basis for the agency's decision, lest it interfere with matters that Congress entrusted to the executive agency, it will uphold a decision of less than ideal clarity if the 'path which [the agency] followed can be discerned'") (quoting *Colorado Interstate Gas Co. v. FPC*, 324 U.S. 581, 595, 65 S.Ct. 829, 836, 89 L.Ed. 1206 (1945)); *Connecticut Dep't of Children & Youth Servs. v. Department of Health & Human Servs.*, 788 F.Supp. 573, 577 (D.D.C.1992) ("Under this standard, the Court is not free to substitute its own judgment, but is limited to determining whether the agency has considered all relevant factors and whether the agency's decision is reasonable and in accordance with the relevant statute. Under the [APA], the standard of review is highly deferential to the agency."). As Cardozo has reminded us, "[t]he judge, even when he is free, is still not wholly free. He is not to innovate at pleasure. He is not a knight-errant, roaming at will in pursuit of his own ideal of beauty or of goodness. He is to draw his inspiration from consecrated principles." Benjamin N. Cardozo, *Nature of the Judicial Process* 141 (Yale Univ.Press, 1921).

Midst all the *sturm und drang*, after all is said and done, the question before the court distills to this: did the Secretary act reasonably? This, of course, depends mainly upon the evidence he had before him. In his testimony, Dr. Robert E. Fay, one of the principal statisticians at the Census Bureau (who, incidently, voted to adjust) pierced right to the heart of the case: "I told the Secretary that ... reasonable statisticians could differ on this conclusion." Tr. at 1909. The Court agrees, and therefore, concludes that the Secretary's decision not to adjust the 1990 census count was neither arbitrary nor capricious.

The PES Tapes

Plaintiffs also move to vacate a protective order, issued by Magistrate Judge Ross, governing certain computer tapes they got from the Government during discovery in this case. These tapes contain the adjusted census data at the block level and are the material that would have been released to the states if the Secretary had decided to adjust.[28] Plaintiffs argue that the Court should vacate the protective order because: (1) plaintiffs already possess the tapes, and, thus, release of the data would not violate any institutional confidence; and (2) release of the tapes is appropriate under 13 U.S.C. § 141(c), which requires the Secretary of Commerce to provide the states with data to be used in redistricting.

---

[28]On July 15, 1991, the day the Secretary announced his decision, he also released to the public the adjusted census data at the national, state, county, and city levels, but not the block level. Subsequently the Department disclosed half of the adjusted block-level data to Congress.

When they opposed production of these tapes before Magistrate Judge Ross, the defendants asserted the "deliberative process" privilege as a basis for their refusal. The "deliberative process" privilege "protects from disclosure those agency documents which reflect 'advisory opinions, recommendations and deliberations comprising part of a process by which governmental decisions and policies are formulated.'" *Mobil Oil Corp. v. Department of Energy*, 102 F.R.D. 1, 5 (N.D.N.Y.1983) (quoting *Mobil Oil Corp. v. Department of Energy*, 520 F.Supp. 414, 416 (N.D.N.Y.1981)).

The privilege is a qualified or discretionary one that turns on a balance of competing policy claims. *See In re Franklin Nat'l Bank Sec. Litig.*, 478 F.Supp. 577, 582 (E.D.N.Y.1979). The privilege does not protect purely factual material. *Id.* at 581. Magistrate Judge Ross assumed arguendo, that the redistricting tapes reflected certain advisory opinions, but found that the benefit to be derived from protecting such information was outweighed by the benefit to accurate judicial fact-finding that would follow upon production of the tapes. Accordingly, she ordered the defendants to produce them, but, at the request of the defendants, also entered a protective order forbidding public disclosure. The Magistrate Judge was aware at the time of what she described as the "hotly contested Ninth Circuit litigation concerning disclosure of these same tapes."

I now have the result of that "hotly contested" Ninth Circuit case. *Assembly of California v. United States Dep't of Commerce*, 968 F.2d 916 (9th Cir.1992). There, the Department of Commerce was asked to release computer tapes containing all the block-level census data for California pursuant to a claim by the California State Assembly under

the Freedom of Information Act, 5 U.S.C. § 552(a) ("FOIA"). The Department of Commerce argued, as it does here, that the data should not be disclosed because of their pre-decisional and deliberative nature.

The district court rejected that argument and ordered the Department of Commerce to produce the data. *Assembly of California v. United States Dep't of Commerce*, 797 F.Supp. 1554 (E.D.Cal.1992). The Commerce Department appealed. Agreeing with the district court's findings that the data were neither pre-decisional nor deliberative, the Ninth Circuit affirmed the order that the tapes be released. 968 F.2d at 923.

A directly contrary result was reached by the Eleventh Circuit in *Florida House of Representatives v. United States Dep't of Commerce*, 961 F.2d 941 (11th Cir.1992). There, the Florida House of Representatives brought a FOIA action to compel the Department of Commerce to release all the adjusted block-level data for Florida. The district court granted summary judgment for Florida, and the Department of Commerce appealed. The Eleventh Circuit reversed, finding that "[b]ecause the adjusted census block level data are a subordinate's opinion and reflect the give-and-take of the deliberative process ... the data are deliberative, and in turn, within the scope of the deliberative process privilege." *Id.* at 950.

Recognizing this split in the circuits, and assuming *arguendo*, that the tapes reflect certain aspects of the deliberative process, I believe the Ninth Circuit has the better of the argument. Whatever interest the Department of Commerce may have had in the confidentiality of the block level counts, that interest was seriously diluted when the

Secretary released one half of all the data to Congress; and, whatever privacy survived as to the block level data for California was lost following the Ninth Circuit's decision.

Balanced against the slight residuary interest that the defendants may have in the confidentiality of the block level data is the public's interest in full access to judicial proceedings, especially where, as here, the dispute has sparked so much public interest. Because I believe that the balance weighs heavily in favor of disclosure under these circumstances, I vacate the protective order and permit the plaintiffs to use and to release to the public the computer tapes containing the adjusted block-level counts.

CONCLUSION

To sum up I: (1) find that the Secretary's decision not to adjust the 1990 census does not violate the APA, the Constitution, the Stipulation, or any statute; and (2) vacate the protective order governing the plaintiffs' use of the computer tapes containing the adjusted block-level counts.

While plaintiffs' counsel has illustrated that adjustment is statistically feasible, and would improve the quality of the counts for most purposes while ameliorating the profoundly disturbing problem of differential undercount, the Court cannot, on the record before it, supplant the Secretary's decision.

Finally, I would be remiss if I did not note the magnificent contribution that several law firms representing the plaintiffs have made in presenting this case to the Court. These firms, Cravath Swaine, and Moore, Arnold & Porter, and Stein, Zauderer, Ellenhorn, Frischer and Sharp have

devoted unusual talent and resources to this case on a pro bono basis. This is in the highest tradition of the Bar. I commend them.

SO ORDERED.

DATED: New York, New York
April 13, 1993

/s/ Joseph M. McLaughlin
JOSEPH M. McLAUGHLIN, U.S.C.J.

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

----------X

THE CITY OF NEW YORK,
THE STATE OF NEW YROK,
THE PEOPLE OF THE STATE OF
CALIFORNIA EX REL. JOHN K.
VAN DE KAMP, ATTORNEY GENERAL,
THE CITY OF LOS ANGELES,
THE CITY OF CHICAGO,
DADE COUNTY, FLORIDA,
THE U.S. CONFERENCE OF MAYORS,
THE NATIONAL LEAGUE OF CITIES,
THE LEAGUE OF UNITED LATIN
AMERICAN CITIZENS,
THE NATIONAL ASSOCIATION FOR THE
ADVANCEMENT OF COLORED PEOPLE,
MARCELLA MAXWELL,
DONALD H. ELLIOTT,
JOHN MACK,
OLGA MORALES,
TIMOTHY W. WRIGHT III,
RAYMOND G. ROMERO,
ANTONIO GONZALES, and
ATHALIE RANGE,

Plaintiffs,

-against-

88 CV 3474

UNITED STATES DEPARTMENT OF COMMERCE,

ROBERT A. MOSBACHER, as Secretary of the United States Department of Commerce,
MICHAEL R. DARBY, as Under Secretary for Economic Affairs of the United States Department of Commerce,
BUREAU OF THE CENSUS,

BARBARA EVERITT BRYANT, as Director of the Bureau of the Census,
GEORGE BUSH, as President of the United States, and
DONALD K. ANDERSON, as Clerk of the United States House of Representatives,

Defendants.

----------X

MEMORANDUM AND ORDER

McLAUGHLIN, District Judge.

Census-taking has never been easy, and has rarely received favorable press. King David learned this the hard way. In First Samuel, the King directed his Census Bureau, one Joab, to "go through all the tribes of Israel From Dan to Bersabee, and number ye the people that I may know the number of them." When Joab had reluctantly counted as far as 800,000, David realized that, in some eyes, his task might be regarded as hubris on the scale of the Tower of Babel. He repented, lamenting: "I have sinned very much in what I have done; But I pray thee O Lord, to take away the iniquity of thy servant because I have done exceedingly

foolishly." The Lord turned a deaf ear for he sent David a pestilence and 70,000 died.

Caesar Augustus fared little better with David's descendant, Joseph, who, it will be recalled, had to travel with Mary to Nazareth for a census count, only to find there was no room for his tiny family in the inn. Christianity thus was founded in a stable--thanks to the census--and, according to Gibbon's *Decline and Fall of the Roman Empire*, it was Christianity that toppled the empire of the Caesars.

Colonial Americans seemed to have heeded these lessons, for no government enumeration of the colonies was ever undertaken. The Founding Fathers, however, were persuaded that the efficient functioning of a new democracy required a census. The original Constitution, therefore, required a simple head count of all Americans every ten years.[1] The task of conducting the first census was given,

---

[1]Article I, Section 2, Clause 3 of the original Constitution provides:

> Representatives and direct Taxes shall be apportioned among the several States which may be included within the Union, according to their respective Numbers, which shall be determined by adding to the whole Number of free Persons, including those bound to Service for a Term of Years, and excluding Indians not taxed, three fifths of all other Persons. The actual Enumeration shall be made within three Years after the first Meeting of the Congress of the United States, and within every subsequent Term of ten Years, in such Manner as they shall by Law direct.

Section 2 of the Fourteenth Amendment further directs:

> Representatives shall be apportioned among the several States according to their respective numbers, counting

not surprisingly, to a patriot who had skipped the Constitutional Convention, Thomas Jefferson. Americans resisted on a grand scale, and matters have not improved in two hundred years.

For whatever reasons it goes against the American grain to submit to counting. In the 1980 count Census Bureau officials concede that they missed at least three million people. Statisticians and demographers claim this is a modest assessment. In any event, no one claims that the count is precise. Indeed, shots rang out as census takers recently approached one building in Brooklyn, thereby aborting further attempts to count that building's occupants.

Various statistical and sampling techniques have been employed, at least to some extent, by the Bureau of the Census to arrive at as accurate a figure as humanly possible, although the Bureau largely adheres to what it refers to as an "actual enumeration." Therein lies the rub, and this lawsuit. Plaintiffs claim that the actual enumeration the Bureau has used in the past and originally intended to use in the 1990 census is skewed to underestimate large blocks of minorities, with most of the undercounting occurring in the large urban areas. If this turns out to be true, the inevitable consequence will be under-representation in the Congress, and under-allocation of government revenues, grants, programs and the like. Plaintiffs argue that the 1990 census should be statistically adjusted to compensate for this "differential undercount" of minorities, if such an adjustment results in the most accurate census practicable.

---

the whole number of persons in each State, excluding Indians not taxed.

FACTS

Plaintiffs began this suit in November 1988, seeking to enjoin the conduct of the 1990 census. Extensive negotiations were conducted in the summer of 1989, culminating on July 17, 1989 with an eleventh-hour stipulation (the "Stipulation") of the parties. The short-term effect of that Stipulation was to moot plaintiffs' motion for a preliminary injunction, halting the immediate course of the 1990 decennial census; the long-term effect of the Stipulation remains to be seen.

Plaintiffs now return to the Court, alleging defendants have violated that Order and Stipulation. Plaintiffs seek two-fold relief. First, plaintiffs ask for a declaratory judgment, declaring that a statistical adjustment of the federal census does not violate the Constitution or 13 U.S.C. § 195.[2] Second, plaintiffs seek a supplemental order from the Court: (1) invalidating the "guidelines" promulgated under the Stipulation for determining whether a practicable statistical correction would increase census accuracy; (2) ordering defendants to adjust the census, unless they demonstrate to the Court that the original enumeration is more accurate or that some other compelling reason prevents a statistical adjustment; and (3) directing defendants to fulfill their obligations to the Special Advisory Panel established under the terms of the Stipulation.

---

[2]The statute provides:

> Except for the determination of population for purposes of apportionment of Representatives in Congress among the several States, the Secretary shall, if he considers it feasible, authorize the use of the statistical method known as "sampling" in carrying out the provisions of this title.

Defendants reject all of plaintiffs' claims as meritless, and they argue that it is improper for the Court to entertain such imagined grievances at this juncture.

Defendants first argue that plaintiffs' claims for a declaratory judgment and for a supplemental order are not ripe for review. Essentially, defendants argue that, although the "guidelines" promulgated pursuant to the Stipulation are final, the Secretary of Commerce (the "Secretary") has not yet applied them. Thus, the Secretary may yet act under the guidelines to adjust the census in a manner that accords with plaintiffs' requests, thereby obviating the need for further relief. Defendants also contend that, since the Secretary has yet to decide whether an adjustment is constitutional, there is no decision ready for review.

Additionally, even if plaintiffs' claims were ripe, according to defendants, the decision whether to adjust is a political question. If so, plaintiffs' claims should be dismissed as nonjusticiable. Finally, if judicial review is proper and some form of relief is available at this time, defendants maintain that the specific relief requested is excessive and wholly unwarranted.

The Stipulation

Under the Stipulation, the Secretary retains all authority and decision-making power, "including without limitation the decision whether or not to adjust the 1990 Decennial Census." Stip. at 1. Defendants forthrightly concede in the Stipulation that a post-enumeration survey ("PES") and other adjustment operations defendants deem necessary will be conducted for the express purpose of achieving the most accurate count practicable.

To insure that this self-imposed mandate will be carried out properly, the Stipulation establishes two linchpin provisions. First, "[d]efendants agree that the Department will promptly develop and adopt guidelines articulating what defendants believe are the relevant technical and nontechnical statistical and policy grounds for decision on whether to adjust the 1990 Decennial Census population counts." Stip. at 3. In addition,

> Defendants shall establish ... an independent Special Advisory Panel (the "Panel") to advise the defendants on all matters relevant to the implementation of this Stipulation and, in particular, and without limitation, the guidelines ..., the application and achievement of the guidelines, the expedition with which defendants are proceeding toward decision on adjustment, and plans and schedules for the implementation of the Census and the PES in a manner that will result in the most accurate final census data at the earliest practicable time.

Stip. at 4-5.

Plaintiffs believe that defendants have failed to fulfill their explicit obligations under each provision.

DISCUSSION

I. POLITICAL QUESTION

Pursuant to the Stipulation, "plaintiffs reserve the right to challenge any of the guidelines ... adopted, omitted, implemented, or announced in connection with or arising out of this Stipulation." Stip. at 7. Despite this language,

defendants maintain that a challenge to the guidelines presents a nonjusticiable political question.[3]

Some actions of the Executive and some interaction between the executive and legislative branches are, in an Article III sense, inappropriate for judicial intrusion. *Holtzman v. Schlesinger*, 484 F.2d 1307, 1309 (2d Cir.), *cert. denied*, 416 U.S. 936, 94 S.Ct. 1935, 40 L.Ed.2d 286 (1974). As a function of separation of powers, cases which raise a political question are nonjusticiable and, by constitutional mandate, preclude judicial intervention. *Baker v. Carr*, 369 U.S. 186, 210, 82 S.Ct. 691, 706, 7 L.Ed.2d 663 (1962). While sensitive to such limitations, this Court is satisfied that a challenge to the final guidelines, even as they relate to the Secretary's yet unmade decision on a census adjustment, does not present a political question.

The identical argument against justiciability arose in litigation, also brought by the City and State of New York, concerning adjustment of the 1980 census. *Carey v. Klutznick*, 508 F.Supp. 404 (S.D.N.Y.1980). The district court, rejecting defendants' suggestion of a political question, found:

> While *Carey v. Klutznick* involves a challenge to the census, and not precisely a challenge to congressional redistricting [as in *Baker v. Carr*, 369 U.S. 186, 82 S.Ct. 691, 7 L.Ed.2d 663 (1962)], the former provides the foundation for apportionment and

---

[3]Generally, a stipulation estops a party from subsequently asserting an inconsistent position. *Gall v. South Branch Nat'l Bank*, 783 F.2d 125, 127 (8th Cir.1986). Giving defendants the benefit of the doubt on consistency, however, the Court will rule on the merits of the objection.

> redistricting and, therefore, the precedents sustaining challenges to congressional redistricting should afford a predicate for finding the claims before the court justiciable.

508 F.Supp. at 411. The court therefore concluded that "both precedent and the intent of the Framers warrant the conclusion that the issues presented [in challenging the census enumeration] are justiciable." *Id.* The Second Circuit affirmed, adding, "We fully recognize that there is no power to review agency action that is 'committed to agency discretion by law,' 5 U.S.C. § 701(a)(2), but this is not one of those 'rare instances' where that exception may be invoked." *Carey v. Klutznick*, 637 F.2d 834, 838 (2d Cir.1980) (citing *Citizens to Preserve Overton Park, Inc. v. Volpe*, 401 U.S. 402, 410, 91 S.Ct. 814, 820, 28 L.Ed.2d 136 (1971)). The Second Circuit thereafter stood by this finding of justiciability, choosing not to reexamine the issue. *Carey v. Klutznick*, 653 F.2d 732, 737 & n. 18 (2d Cir.1981).

The justiciability of plaintiffs' claim is established by precedent not only in this circuit, but in other jurisdictions as well. *City of Willacoochee v. Baldrige*, 556 F.Supp. 551, 557 (S.D.Ga.1983); *City of Philadelphia v. Klutznick*, 503 F.Supp. 663, 674 (E.D.Pa.1980); *Young v. Klutznick*, 497 F.Supp. 1318, 1326 (E.D.Mich.1980), *rev'd on other grounds*, 652 F.2d 617 (6th Cir.1981), *cert. denied*, 455 U.S. 939, 102 S.Ct. 1430, 71 L.Ed.2d 650 (1982).

II. RIPENESS

Defendants argue in the alternative that the Court lacks authority to hear plaintiffs' grievances at this time

because none of plaintiffs' claims are ripe for review. Defendants declare unripe plaintiffs' claim that the final census guidelines violate the Stipulation, as well as plaintiffs' demand for a declaratory judgment on the legality and constitutionality of an adjusted census.

A matter is ripe when there is "a genuine need to resolve a real dispute." 13A Wright, Miller & Cooper, *Federal Practice and Procedure* § 3532.1 at 114 (1984). As a general proposition, ripeness is "very much a matter of practical common sense." *Continental Air Lines, Inc. v. CAB*, 522 F.2d 107, 124 (D.C.Cir.1974) (en banc) (citing *Abbott Laboratories, Inc. v. Gardner*, 387 U.S. 136, 87 S.Ct. 1507, 18 L.Ed.2d 681 (1967)). More specifically, however, a two-part test governs the issue because "ripeness turns on 'the fitness of the issues for judicial decision' and 'the hardship to the parties of withholding court consideration.'" *Pacific Gas & Elec. Co. v. State Energy Resources Conservation & Dev. Comm'n*, 461 U.S. 190, 190-91, 103 S.Ct. 1713, 1716, 75 L.Ed.2d 752 (1983) (quoting *Abbott Laboratories*, 387 U.S. at 149, 87 S.Ct. at 1515).

A. *The Guidelines*

Defendants concede the guidelines "are final as far as they go." Def. Mem. in Opp. at 11. When agencies are involved, the administrative action must first be sufficiently final before it is fit for review. *Abbott Laboratories*, 387 U.S. at 149, 87 S.Ct. at 1515; *see also In re Combustion Equip. Assoc., Inc.*, 838 F.2d 35, 38 (2d Cir.1988). A determination of fitness also includes inquiry into whether the issue is purely a legal one, or whether a court could better resolve the issue in a more concrete setting, i.e., the

context of a specific attempt to apply the agency decision. *See In re Combustion Equip. Assoc., Inc.*, 838 F.2d at 38 (citing *Gardner v. Toilet Goods Assoc.*, 387 U.S. 167, 171, 87 S.Ct. 1526, 1528, 18 L.Ed.2d 704 (1967)); *Ciba-Geigy Corp. v. EPA*, 801 F.2d 430, 435 (D.C.Cir. 1986); *Riley v. Ambach*, 668 F.2d 635, 642 (2d Cir.1981).

If the issue surrounding agency action is a purely legal one "in which no further facts need be developed to facilitate a proper judicial decision, a *final* agency action may be fit for review even though it has never been applied or enforced by the agency in a concrete setting." *Alascom, Inc. v. FCC*, 727 F.2d 1212, 1217 (D.C.Cir.1984) (emphasis in original). In fact, when final agency action involves a purely legal question, there is a threshold assumption of suitability for judicial determination. *Eagle-Picher Indus. v. EPA*, 759 F.2d 905, 915 (D.C.Cir.1985).

The second aspect in evaluating ripeness is the hardship involved in withholding court consideration. Contested agency action must have an impact on the challenging parties "sufficiently direct and immediate as to render the issue appropriate for judicial review at this stage." *Abbott Laboratories*, 387 U.S. at 152, 87 S.Ct. at 1517; *see Toilet Goods Assoc. v. Gardner*, 387 U.S. 158, 164, 87 S.Ct. 1520, 1524, 18 L.Ed.2d 697 (1967).

It is quite clear that, under the facts of this case, the finality of the promulgated guidelines makes them ripe for judicial review. Unquestionably, the only outstanding issue is a legal one, namely, whether the guidelines as finally drafted satisfy defendants' obligations under the Stipulation.

No further facts or applications are necessary to give this controversy sharper focus.

This Court is aware that a window of opportunity will close with time, imposing direct hardship on plaintiffs. The final guidelines articulate the "grounds for decision on whether to adjust the 1990 Decennial Census population counts." Stip. at 3. That decision admittedly results from an ongoing process, one shaped and matured by the progress of the post-enumeration statistical survey. Moreover, the PES is fast approaching, scheduled to commence at the end of June.

Defendants are obligated to determine whether an adjustment, based upon PES results, satisfies the guidelines. *Id.* Most critically, in the event defendants decide not to adjust, defendants bear the burden to explain their decision in a detailed statement of reasons, pointing out which guidelines were not met. *Id.* at 4.

In this sense the guidelines, as mutually intended, lay the foundation and establish the framework for a principled decision by the Secretary. The right to challenge the guidelines, as discussed *supra*, was expressly reserved by plaintiffs in the Stipulation. Plaintiffs clearly have a right to prove, if they can, fatal cracks in the foundation; and they have that right now. The resulting hardship of postponing that challenge until after the Secretary's decision is an indefensible temporizing.

A stipulation, so ordered by the Court, is a contract negotiated between parties. *Berger v. Heckler*, 771 F.2d 1556, 1567 (2d Cir.1985); *see also United States v. Armour & Co.*, 402 U.S. 673, 681, 91 S.Ct. 1752, 1757, 29

L.Ed.2d 256 (1971); *Dotson v. HUD*, 731 F.2d 313, 318 (6th Cir.1984). The failure of an agency to act, in breach of a stipulation, poses a threat "sufficiently real and immediate to amount to an existing controversy entitling [plaintiffs] to enforce the decree." *Berger v. Heckler*, 771 F.2d at 1564.[4]

B. *Declaratory Judgment*

Whether plaintiffs' request for a declaratory judgment is ripe is more troublesome. Declaratory judgment actions should be entertained "when the judgment will serve a useful purpose in clarifying and settling the legal relations in issue, and ... when it will terminate and afford relief from the uncertainty, insecurity, and controversy giving rise to the proceeding." *Fort Howard Paper Co. v. William D. Witter, Inc.*, 787 F.2d 784, 790 (2d Cir.1986) (citing *Broadview Chem. Corp. v. Loctite Corp.*, 417 F.2d 998 (2d Cir.1969), *cert. denied*, 397 U.S. 1064, 90 S.Ct. 1502, 25 L.Ed.2d 686 (1970) (quoting E. Borchard, *Declaratory Judgments* 299 (2d ed. 1941)).

The dispute involved must not be hypothetical or academic, or a request in the abstract for an advisory opinion; it must be "a definite, concrete controversy of sufficient immediacy to warrant the issuance of a declaratory judgment." *Broadview Chem. Corp.*, 417 F.2d at 1000; *see generally Aetna Life Ins. Co. v. Haworth*, 300 U.S. 227,

---

[4]For these reasons the Court also finds the Special Advisory Panel issues, *infra*, ripe for review.

240, 57 S.Ct. 461, 463, 81 L.Ed. 617 (1937).[5] Even when a declaratory judgment claim is justiciable, it is well settled that the decision to exercise declaratory jurisdiction rests with the discretion of the trial court. *Broadview Chem. Corp.*, 417 F.2d at 1000; *Muller v. Olin Mathieson Chem. Corp.*, 404 F.2d 501, 505 (2d Cir.1968).

According to plaintiffs, guideline five[6] prompted a swift and immediate request for declaratory relief. The Court sympathizes with plaintiffs' concern that, in raising the specter of doubt, defendants undermine a legitimate effort to achieve the most accurate census practicable through adjustment. Something not worth doing at all is certainly not worth doing well. The Court is confident, however, that it can allay at least some of those fears.

It is no longer novel or, in any sense, new law to declare that statistical adjustment of the decennial census is both legal and constitutional. This Court has already recognized that Article I, § 2 "require[s] that the census be

---

[5]The Declaratory Judgment Act provides:

> In a case of actual controversy within its jurisdiction ... any court of the United States, upon the filing of an appropriate pleading, may declare the rights and other legal relations of any interested party seeking such declaration, whether or not further relief is or could be sought. Any such declaration shall have the force of a final judgment or decree and shall be reviewable as such. 28 U.S.C. § 2201; *see also* Fed.R.Civ.P. 57.

Where there is a substantial controversy between the parties having adverse legal interests of sufficient immediacy, a case is ripe for declaratory relief. *Employers Ass'n v. State of New Jersey*, 601 F.Supp. 232 (D.C.N.J.), aff'd, 774 F.2d 1151 (3rd Cir.1985).

[6]See, *infra*, text accompanying note 9.

as accurate as practicable." *City of New York v. Dep't of Commerce*, 713 F.Supp. 48, 50 (E.D.N.Y.1989). *See also Karcher v. Daggett*, 462 U.S. 725, 730, 103 S.Ct. 2653, 2658, 77 L.Ed.2d 133 (1983) (congressional districts must be apportioned to achieve equal population "as nearly as is practicable"); *Wesberry v. Sanders*, 376 U.S. 1, 84 S.Ct. 526, 11 L.Ed.2d 481 (1964); *Carey v. Klutznick*, 637 F.2d 834, 839 (2d Cir.1980).

Confronted with mirrored claims of illegality and unconstitutionality, the trial court in *Carey v. Klutznick*, *supra*, concluded "that defendants[']constitutional and statutory objections concerning the impropriety of employing statistical adjustments to compensate for the undercount [are] without merit." 508 F.Supp. 415. Decisions by other courts arrive at the same result. *See, e.g., City of Philadelphia v. Klutznick*, 503 F.Supp. 663, 679 (E.D.Pa.1980) (holding that "the Constitution permits the Congress to direct or permit the use of statistical adjustment factors in arriving at the final census results used in reapportionment" and also "that the Census Act permits the Bureau to make statistical adjustments in the headcount"); *Young v. Klutznick*, 497 F.Supp. 1318, 1332-33 (E.D.Mich.1980) ("[N]othing in the Constitution ... prohibits adjustment techniques."), *rev'd on other grounds*, 652 F.2d 617 (6th Cir.1981), *cert. denied*, 455 U.S. 939, 102 S.Ct. 1430, 71 L.Ed.2d 650 (1982); *see also Cuomo v. Baldrige*, 674 F.Supp. 1089, 1096 n. 13 (S.D.N.Y.1987).

This Court concludes that because Article I, § 2 requires the census to be as accurate as practicable, the Constitution is not a bar to statistical adjustment. I am similarly persuaded by the reasoning of *Carey v. Klutznick*, *supra*, as affirmed by the Second Circuit, that "in the area

of apportionment where important constitutional rights are at stake, the Census Bureau may utilize sampling procedures but only in addition to more traditional methods of enumeration." 508 F.Supp. at 415 (citing *Young v. Klutznick*, 497 F.Supp. at 1318).[7]

That said, it does not follow that any and all forms of statistical adjustments will be sanctioned. General principles, as Holmes observed, do not decide concrete cases. And this is not the occasion to prescribe what adjustments may or may not be made. The PES has not yet begun and the final form of the suggested statistical adjustment for 1990 remains to be seen. Reason and common sense dictate that, while constitutional and legal concerns will shape the end product, they should in no way hamper the effort. The concept of statistical adjustment is wholly valid, and may very well be long overdue. Whether it has been done legally and constitutionally can only be determined after the Secretary has decided how he wishes to adjust, if at all.

---

[7]In so concluding, the district court considered 13 U.S.C. sections 141(a) and 195 *in pari materia*, nullifying neither provision and giving effect and meaning to both. 508 F.Supp. at 415. 13 U.S.C. § 141(a) provides:

> The Secretary shall ... take a decennial census of population ... in such form and content as he may determine, including the use of sampling procedures and special surveys. In connection with any such census, the Secretary is authorized to obtain such other census information as necessary.

III. BREACH OF A STIPULATION

Stipulations so ordered by the Court, like consent decrees, are a hybrid. Being at once both contracts and judicial orders, "they are construed largely as contracts, but are enforced as orders." *Berger v. Heckler*, 771 F.2d 1556, 1568 (2d Cir.1985); *see United States v. ITT Continental Baking Co.*, 420 U.S. 223, 236 n. 10, 95 S.Ct. 926, 934 n. 10, 43 L.Ed.2d 148 (1975); *SEC v. Levine*, 881 F.2d 1165, 1178 (2d Cir.1989); *Schurr v. Austin Galleries*, 719 F.2d 571, 574 (2d Cir.1983). The Court retains continuing jurisdiction over the decree to supervise and enforce it. *Berger v. Heckler*, 771 F.2d at 1568; *Wilder v. Bernstein*, 645 F.Supp. 1292, 1308 (S.D.N.Y.1986), *aff'd*, 848 F.2d 1338 (2d Cir.1988).

The Court discerns the meaning of such decrees from the four corners of the document. *United States v. Armour & Co.*, 402 U.S. 673, 681-82, 91 S.Ct. 1752, 1757-58, 29 L.Ed.2d 256 (1971); *SEC v. Levine*, 881 F.2d at 1179; *Canterbury Belts Ltd. v. Lane Walker Rudkin, Ltd.*, 869 F.2d 34, 38 (2d Cir.1989). A court construing a stipulation is "not entitled to expand or contract the agreement of the parties as set forth in the consent decree." *Berger v. Heckler*, 771 F.2d at 1568; *see also Taitt v. Chemical Bank*, 810 F.2d 29, 33 (2d Cir.1987) ("Accordingly, we view the order ... as facilitating and effectuating, but not expanding, the intent of the parties as found in the four corners of the consent decree."); *SEC v. Levine*, 881 F.2d at 1179.

Deference is paid to the explicit language and the plain meaning of language in the decree, including normal usage of the words selected. *Berger v. Heckler*, 771 F.2d at 1568. The Court may not, in any case, "participate in any

bargaining for better terms." *Plummer v. Chemical Bank*, 668 F.2d 654, 655 n. 1 (2d Cir.1982).

Moreover, "[e]xtrinsic evidence ... may generally be considered *only* if the terms of the judgment, or if the documents incorporated in it, are ambiguous." *SEC v. Levine*, 881 F.2d at 1179 (emphasis added); *see also Canterbury Belts Ltd. v. Lane Walker Rudkin, Ltd.*, 869 F.2d at 38. None of the parties have argued that the terms of the Stipulation are ambiguous.[8]

---

[8]Whether or not the "contract language" of a settlement stipulation is ambiguous is a question of law for the Court. *Burger King Corp. v. Horn & Hardart Co.*, 893 F.2d 525, 527 (2d Cir.1990); *Curry Road Ltd. v. Kmart Corp.*, 893 F.2d 509, 511 (2d Cir.1990); *Pantone Inc. v. Esselte Letraset, Ltd.*, 878 F.2d 601, 605 (2d Cir.1989); *see also Grumman Allied Indus., Inc. v. Rohr Indus., Inc.*, 748 F.2d 729, 734 & n. 9 (2d Cir.1984) (disagreeing with trend toward making contextual inquiry to determine whether language is ambiguous).

> Language is ambiguous if it is:
> capable of more than one meaning when viewed objectively by a reasonably intelligent person who has examined the context of the entire integrated agreement and who is cognizant of the customs, practices, usages and terminology as generally understood in the particular trade or business.

Pantone, 878 F.2d at 606 (quoting *Eskimo Pie Corp. v. Whitelawn Dairies, Inc.*, 284 F.Supp. 987, 994 (S.D.N.Y.1968); *Burger King*, 893 F.2d at 527; *see also Adipietro v. Chubb Life American*, 736 F.Supp. 29, 33 (E.D.N.Y.1990). In reviewing the critical language of the Stipulation calling for the promulgation of agency guidelines and the establishment of a Special Advisory Panel, I conclude the Stipulation is not ambiguous.

A. *The Guidelines*

Under the agreed terms of the Stipulation, defendants promulgated the following eight final guidelines:[9]

> 1. The Census shall be considered the most accurate count of the population of the United States, at the national, state, and local level, unless an adjusted count is shown to be more accurate. The criteria for accuracy shall follow accepted statistical practice and shall require the highest level of professional judgment from the Bureau of the Census. No statistical or inferential procedure may be used as a substitute for the Census. Such procedures may only be used as supplements to the Census.
>
> 2. The 1990 Census may be adjusted if the adjusted counts are consistent and complete across all jurisdictional levels: national, state, local, and census block. The resulting counts must be of sufficient quality and level of detail to be *usable* for

---

[9]Pursuant to the Stipulation defendants were required to publish proposed guidelines in the Federal Register by December 10, 1989 with a request for comments. Final guidelines were to be published in the Federal Register by March 10, 1989. Stip. at 3.

Defendants published twelve proposed guidelines with substantial "explanation" sections and a request for comments. Proposed Guidelines For Statistical Adjustment of 1990 Census, 54 Fed.Reg. 51,002 (Dec. 11, 1989). A second notice announced an extension to February 2, 1990 as the last date for comments. 55 Fed.Reg. 2,397 (Jan. 24, 1990). Final guidelines were published March 15, 1990. Defendants again included accompanying explanations, summarized the comments received and stated reasons for changes. Final Guidelines For Statistical Adjustments of 1990 Census, 55 Fed.Reg. 9,838 (March 15, 1990).

Congressional reapportionment and legislative redistricting, and for all other purposes and at all levels for which census counts are published.

3. The 1990 Census may be adjusted if the estimates generated from the pre-specified procedures that will lead to an adjustment decision are shown to be more accurate than the census enumeration. In particular, these estimates must be shown to be robust to variations in reasonable alternatives to the production procedures, and to variations in the statistical models used to generate the adjusted figures.

4. The decision whether or not to adjust the 1990 Census should take into account the effects such a decision might have on future census efforts.

5. Any adjustment of the 1990 Census may not violate the United States Constitution or Federal statutes.

6. There will be a determination whether to adjust the 1990 Census when sufficient data are available, and when analysis of the data is complete enough to make such a determination. If sufficient data and analysis of the data are not available in time to publish adjusted counts by July 15, 1991, a determination will be made not to adjust the 1990 Census.

7. The decision whether or not to adjust the 1990 Census shall take into account the potential disruption of the process of the orderly transfer of political

representation likely to be caused by either course of action.

8. The ability to articulate clearly the basis and implications of the decision whether or not to adjust shall be a factor in the decision. The *general rationale* for the decision will be clearly stated. The technical documentation lying behind the adjustment decision shall be in keeping with professional standards of the statistical community.

Most of these guidelines are embellished with an accompanying "explanation". Plaintiffs argue that the guidelines violate the Stipulation, challenging that they do not set forth technical standards for decision, contain a built-in bias against adjustment and permit the Secretary to base his decision on impermissible factors.

The operative language of the Stipulation provides that the Department of Commerce would develop and adopt "guidelines articulating what *defendants* believe are the technical and nontechnical statistical and policy grounds for decision." Stip. at 3 (emphasis added). For better or for worse, the Department has done so. It is now clear that the guidelines are not those the plaintiffs would have authored; but it is equally clear that the right to directly contribute to substantive guideline language has been surrendered.

Quite simply, the Stipulation envisions a spectrum of acceptable guideline-making behavior by defendants. It is, by virtue of the Stipulation, defendants' duty to operate within that range. A range implies flexibility; but flexibility, as agreed upon by the parties, may be incorporated into a stipulation. *Canterbury Belts Ltd. v. Lane Walker Rudkin,*

Ltd., 869 F.2d at 38. It is also the law of this circuit that a court should avoid unnecessary intrusion into the administrative process. *Schisler v. Heckler*, 787 F.2d 76, 84 (2d Cir.1986). A court clearly oversteps its bounds when it requires that an agency, to fulfill obligations under a consent decree, use certain language in promulgating regulations. *Rice v. Heckler*, 640 F.Supp. 1051, 1059 (S.D.N.Y.1986) (citing *Berger v. Heckler*, 771 F.2d at 1578).

Defendants could have responded generously, quenching plaintiffs' understandable but nonetheless insatiable thirst to know everything in advance of the Secretary's decision. Defendants have not done so, offering instead the bare minimum. The only question for the Court is whether the guidelines satisfy an acceptable threshold. I conclude that, while the issue is indeed close, defendants have satisfied their obligations thus far.

Although plaintiffs interpret the guidelines as biased against adjustment, the Court does not view them that way. The Stipulation itself is not perfectly neutral, and that lack of neutrality sometimes works in plaintiffs' favor. For example, defendants are required to publish a detailed statement and explanation, but only in the event the Secretary decides not to adjust. Stip. at 4. The ultimate decision on whether to adjust, of course, must be fresh and unbiased, following the Secretary's *de novo* review of the record. That good faith discretion, I am convinced, is preserved under the guidelines.

Second, plaintiffs object to the failure of the guidelines to articulate sufficiently technical standards. In this regard, there has been much talmudic dissection by both sides of the Stipulation's requirement that defendants produce

"guidelines" as opposed to "standards". Rising above a semantic wrangling of words, which may wrongly re-work the benefit of the original bargain, the Court returns to the mandate of the Stipulation that defendants develop and adopt guidelines to articulate grounds for decision. Stip. at 3. While, again, defendants have not done this to plaintiffs' satisfaction, defendants have, in the Court's judgment, complied with the terms of the Stipulation.

I find most troublesome plaintiffs' third and final objection, that the guidelines allow the Secretary to rely on impermissible factors in making the critical decision on adjustment. It is more accurate to say, however, that the guidelines list valid factors for decision-making but that they are subject--like any set of rules--to being impermissibly contorted to justify a flawed final decision.

Plaintiffs' protection against such anticipated abuse is the added requirement under the Stipulation that defendants fully explain a decision not to adjust. Because defendants have chosen to contribute adequate but minimal performance to satisfy their obligations at this stage, defendants clearly incur a heavier burden to explain why no adjustment was made in the event the Secretary elects to proceed with an actual enumeration.

Admittedly, guidelines five through eight lend themselves easily to abuse. This Court has already granted, *supra*, a declaratory judgment on the constitutional and statutory facets of adjustment. That judgment effectively moots plaintiffs' concerns over guideline five.

Regarding guideline six, the Court reminds defendants that the Stipulation provides:

> If the Secretary determines to make an adjustment, defendants shall publish corrected 1990 Decennial Census population data *at the earliest practicable date* and, in all events, not later than July 15, 1991. If the Secretary determines not to make an adjustment, defendants shall publish *at the earliest practicable date* and, in all events, not later than July 15, 1991, a detailed statement of its grounds, including a detailed statement of which guidelines ... were not met and in what respects such guidelines were not met.

Id. at 4 (emphasis added). When the parties entered into the Stipulation, defendants affirmatively represented that the PES and adjustment-related operations were feasible goals as scheduled. Stip. at 2. Intentional inaction will not be tolerated. Defendants are expected, and indeed required, to honor their solemn commitments embodied in the Stipulation. *United States v. City of Yonkers*, 856 F.2d 444, 457 (2d Cir.1988), *rev'd on other grounds sub nom.*, ___ U.S. ____, 110 S.Ct. 625, 107 L.Ed.2d 644 (1990).

I have considered, but rejected the option of vacating guidelines seven and eight. These guidelines may, in a constructive fashion, help define the meaning of "the most accurate census practicable." To that extent they are permissible factors. Again, the Court defers to the explicit language of the Stipulation providing that defendants will develop guidelines on what "they believe" to be the relevant grounds for decision. Defendants, however, are on notice, if it is not already clear, that backdoor attempts to evade their commitment will not be countenanced. *See City of Yonkers* at 457.

B. *The Special Advisory Panel*

Plaintiffs return to court, charging in part that defendants have breached obligations to the Special Advisory Panel. Specifically, plaintiffs allege that defendants have impermissibly "juggled" the accounting books, depleting the $500,000 panel fund with improper and inflated charges. I agree.

The Stipulation is quite precise on matters involving the eight-member advisory panel. Concerning money matters, the Stipulation requires that the Department of Commerce pay members a daily stipend for each day the panel meets and reimburse members for expenses. Stip at 6. The Department must also furnish the panel with appropriate meeting space, office facilities and clerical assistance. In addition, "Defendants shall make available to the Panel a fund of $500,000 against which each co-chair may draw ... for appropriate resources to ensure that Panel members can perform their mission." *Id.*

The problem is that defendants have charged against the fund all costs for stipends, reimbursements and office space. To some panel members the office space provided was lavish and unnecessary, especially in light of the initial rent which was well above $100,000. Ericksen Affidavit at 13. Even by the government's own estimates rendered in February of this year, more than $340,000 has been syphoned from the fund. *Id.* at Exh. L.

A plain reading of the Stipulation convinces the Court that defendants' duty to provide specific services, as catalogued by the explicit language, is in addition to the duty of establishing the $500,000 fund. Oddly enough,

defendants assured the Court at the hearing that money was not a problem and that, if it ran out, more could be found. Indeed, if appropriation ever did become a problem for defendants, the Court has resources of its own.[10]

CONCLUSION

Accordingly, the motion for a declaratory judgment is hereby granted with the understanding that statutory and constitutional concerns will remain relevant in regard to the final form of statistical adjustment. The motion for a supplemental order is granted in part and denied in part, as set forth herein.

SO ORDERED.

Dated: Brooklyn, New York
June 7, 1990

/s/ Joseph M. McLaughlin
JOSEPH M. McLAUGHLIN, U.S.D.J.

---

[10] *Cf. Missouri v. Jenkins*, ___ U.S. ___, 110 S.Ct. 1651, 109 L.Ed.2d 31 (1990) (to give effect to a desegregation order, federal court could authorize school district to submit levy to local tax authorities for adequate funding, even though satisfying levy violated tax laws).

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

----------X

THE CITY OF NEW YORK,
THE STATE OF NEW YORK,
THE PEOPLE OF THE STATE OF
CALIFORNIA EX REL. JOHN K.
VAN DE KAMP, ATTORNEY GENERAL,
THE CITY OF LOS ANGELES,
THE CITY OF CHICAGO,
DADE COUNTY, FLORIDA,
THE U.S. CONFERENCE OF MAYORS,
THE NATIONAL LEAGUE OF CITIES,
THE LEAGUE OF UNITED LATIN
AMERICAN CITIZENS,
THE NATIONAL ASSOCIATION FOR THE
ADVANCEMENT OF COLORED PEOPLE,
MARCELLA MAXWELL,
DONALD H. ELLIOTT,
JOHN MACK,
OLGA MORALES,
TIMOTHY W. WRIGHT III,
RAYMOND G. ROMERO,
ANTONIO GONZALES, and
ATHALIE RANGE,

Plaintiffs,

-against- 88 CV 3474

UNITED STATES DEPARTMENT OF COMMERCE,
C. WILLIAM VERITY, as Secretary of the
United States Department of Commerce,

ROBERT ORTNER, as Under Secretary for Economic Affairs of the United States Department of Commerce,
BUREAU OF THE CENSUS,
JOHN G. KANE, as Director of the Bureau of the Census,
RONALD W. REAGAN, as President of the United States, and
DONALD K. ANDERSON, as Clerk of the United States House of Representatives,

Defendants

----------X

MEMORANDUM AND ORDER

McLAUGHLIN, District Judge.

Defendants move pursuant to Fed.R.Civ.P. 12(b)(1) to dismiss this action for want of subject matter jurisdiction. In the alternative, defendants move pursuant to Fed.R.Civ.P. 12(b)(6) or 56(b) for an order dismissing the Complaint. For the reasons discussed below, the motions are denied.

FACTS

The Census Bureau is about to embark on its constitutionally mandated task of conducting the 1990 census. Plaintiffs bring this action challenging the methodology of conducting that census. Defendants object that plaintiffs do not have standing to sue.

Plaintiffs are the States of New York and California; the Cities of New York, Los Angeles, Chicago and Houston; Dade County, Florida; the United States Conference of Mayors; the National League of Cities; the League of United Latin American Citizens; and the NAACP. The individual plaintiffs are citizens and taxpayers of the aforementioned cities and states.

On the standing issue, the Court accepts all material allegations of the Complaint as true. *Warth v. Seldin*, 422 U.S. 490, 501, 95 S.Ct. 2197, 2206, 45 L.Ed.2d 343 (1975). Since plaintiffs have had an opportunity to supplement the Complaint with affidavits, the Court must be satisfied that plaintiffs' standing adequately appears from the record.

DISCUSSION

I. STANDING

To establish standing under Article III of the Constitution, a plaintiff must demonstrate (1) "a personal stake in the outcome of the controversy," *Baker v. Carr*, 369 U.S. 186, 204, 82 S.Ct. 691, 703, 7 L.Ed.2d 663 (1962), which amounts to a "distinct and palpable injury to himself," *Warth v. Seldin*, *supra*, 422 U.S. at 501, 95 S.Ct. at 2206; (2) that is redressable by the Court, *Simon v. Eastern Kentucky Welfare Rights Organization*, 426 U.S. 26, 39, 96 S.Ct. 1917, 1924, 48 L.Ed.2d 450 (1976); and (3) "a fairly traceable causal connection between the injury and the challenged conduct." *Duke Power Co. v. Carolina Environmental Study Group, Inc.*, 438 U.S. 59, 72, 98 S.Ct. 2620, 2629, 57 L.Ed.2d 595 (1978).

A. *The Injury Element*

The decennial census determines, among other things, the apportionment of representatives in Congress and in state legislatures, the allocation of Electoral College votes in presidential elections, and the equitable distribution of federal funds for housing, education, and transportation. Although Article I, § 2 of the Constitution has been interpreted to require that the census be as accurate as practicable, *see Karcher v. Daggett*, 462 U.S. 725, 103 S.Ct. 2653, 77 L.Ed.2d 133 (1983); *Wesberry v. Sanders*, 376 U.S. 1, 84 S.Ct. 526, 11 L.Ed.2d 481 (1964), since 1940, the decennial census has consistently undercounted the American population. Minority groups comprise a large portion of the undercount. Plaintiffs seek to secure their constitutional and statutory rights to maintain both the efficacy of their votes and their entitlement to an equitable portion of federal funds.[1] Defendants argue that this claimed injury is not "concrete" and is based on mere speculation that the 1990 will be inaccurate.

To invoke the jurisdiction of this Court, plaintiffs must demonstrate more than a mere "conjectural" or

---

[1]The Court need not and will not cloud this already complicated issue by seeking to determine whether the organizational plaintiffs--who allege loss of both political representation and federal funding have standing or whether the other injury alleged by plaintiff States and municipalities--deprivation of the use of accurate population figures for government planning--is a sufficient injury for standing purpose. Defendants make no serious challenge thereto. The Court only notes that the sufficiency of this latter injury is highly questionable because plaintiff States and municipalities are not required to use the Census Bureau's figures for any intrastate activity. *See Cuomo v. Baldrige*, 674 F.Supp. 1089, 1105-06 n. 31 (S.D.N.Y.1987).

"hypothetical" injury--they also must show that they have sustained or are in immediate danger of sustaining a direct injury as a result of the challenged conduct. *City of Los Angeles v. Lyons*, 461 U.S. 95, 102, 103 S.Ct. 1660, 1665, 75 L.Ed.2d 675 (1983).

Defendants concede that plaintiffs' allegation of loss of federal funds satisfies the injury requirement of standing for the State and municipal plaintiffs. Because, however, a question has been raised whether the individual plaintiffs have standing to pursue their constitutional claims, *see FAIR v. Klutznick*, 486 F.Supp. 564, 569 n. 9 (D.D.C.), *appeal dismissed*, 447 U.S. 916, 100 S.Ct. 3005, 65 L.Ed.2d 1109 (1980), the Court will determine whether loss of political representation is sufficiently concrete for standing purposes.

Defendants argue that even if a disproportionate undercount occurs, and that it has an effect on the national apportionment of the United States House of Representatives, plaintiffs cannot demonstrate specifically where that effect will fall. In other words, defendants contend that no one, including plaintiffs, can determine in advance of the census which geographical area of the United States will be undercounted.

Plaintiffs, in response have submitted affidavits by persons who are former employees of the Census Bureau, tending to show (1) that, as defendants concede, there will be an undercount of minorities in the 1990 census; (2) that a disproportionate number of minorities reside in plaintiff States and municipalities; and (3) that as a result thereof, plaintiffs are now and will continue to be underrepresented in Congress.

I find that these factually supported allegations are sufficient to meet the requirement that plaintiffs suffer immediate threat of injury. The Court therefore concludes: that the individual plaintiffs have established a concrete injury in the form of alleged dilution of their votes; and that the State and municipal plaintiffs have established an injury in the form of loss of federal funding.

B. *Whether These Alleged Injuries Are Redressable By This Court*

Plaintiffs must also demonstrate that there exists a "'substantial likelihood' that the relief requested will redress the injury claimed." *Duke Power Co., supra*, 438 U.S. at 75 n. 20, 98 S.Ct. at 2631 n. 20. As indicated earlier, the specific injuries are loss of political representation and loss of federal funding. The relief plaintiffs request would require defendants to conduct a full-scale "post-enumeration survey" and take any other steps necessary to correct the 1990 census for undercounts and overcounts in population. The question thus distills to whether there is a "substantial likelihood" that a "post-enumeration survey" will create the most accurate 1990 census possible thereby ensuring fair representation in Congress and equitable distribution of federal funds.

Defendants point out that even if a post-enumeration survey were ordered by this Court, it is unlikely that this relief would create the most accurate 1990 census. Defendants assert indeed that a post-enumeration survey would actually create a less accurate 1990 census. Evidence submitted by defendants demonstrates that the relief plaintiffs request would require the Census Bureau to make major changes in the census now planned and employ a method of

adjusting the census that is untested and, hence, unproven. Defendants also note that the implementation of adjustment techniques will jeopardize their ability to meet their deadline, set by Congress at 13 U.S.C. § 141(b), to present a tabulation of total population by states to the President by December 31, 1990.

The latter argument, which addresses the operational feasibility of the adjustment, however, is a red herring. The nine-month time period between April and December set forth at § 141(b) is neither "sacred," as the Second Circuit recognized in *Carey v. Klutznick*, 637 F.2d 834, 837 (2d Cir.1980), nor "mandatory" as held by Judge Gilmore in *Young v. Klutznick*, 497 F.Supp. 1318 (E.D.Mich.1980), *rev'd on other grounds*, 652 F.2d 617 (6th Cir.1981), *cert. denied*, 455 U.S. 939, 102 S.Ct. 1430, 71 L.Ed.2d 650 (1982). It is not Congress' intent to sacrifice accuracy for the sake of timeliness. If the Census Bureau demonstrates that accurate adjusted figures cannot be compiled by December 31, 1990, this Court is empowered to grant it a reasonable extension of time.

Plaintiffs, on the other hand, submit evidence that adjustment of the census calculation *is* operationally feasible. *See* Plaintiff's Motion for Preliminary Injunction, Exhibit 24. Since most, if not all, of defendants' concern with the employment of a post-enumeration adjustment surrounds the operational feasibility of the adjustment, and since the adjustment can be made either within the statutory time frame or a judicial extension thereof, the dispositive question becomes whether a post-enumeration survey is technically feasible.

To support the technical feasibility of a post-enumeration survey, plaintiffs submit affidavits from Dr. Stephen Feinberg and Dr. Eugene Ericksen. These experts have concluded that correction methodology has been tested successfully, is feasible and would result in a substantially more accurate census. Plaintiffs also submit an affidavit from Dr. Barbara Bailar, who not only worked for the Census Bureau for 30 years, but was its Associate Director for Statistical Standards and Methodology. Dr. Bailar also opines that statistical adjustment is feasible. She is supported in that position by the Census Bureau Undercount Research Staff and each professional group from whom the Bureau sought an opinion--the Committee on National Statistics of the National Academy of Sciences; the Census Advisory Committee of the American Statistical Association and the Census Advisory Committee on Population Statistics.

The evidence submitted by defendants tending to contradict plaintiffs' proof of technical feasibility is so intertwined with their argument of operational *in* feasibility, that it is virtually impossible to cut this Gordian knot.

Needless to say, the dispute regarding technical feasibility is a classic battle of the experts. On this record, I conclude that plaintiffs have--at this juncture--sustained their burden of demonstrating that a substantial likelihood exists that a post-enumeration adjustment will produce the most accurate 1990 census possible.

C. *Causal Connection Between The Injury And The Challenged Conduct*

Plaintiffs finally must demonstrate that a causal connection exists between the injury alleged and the challenged conduct. *Duke Power*, *supra*, 438 U.S. at 72, 98 S.Ct. at 2629. With respect to the State and municipal plaintiffs, defendants concede that a causal connection does exist between the loss of federal funds and the failure to conduct a post-enumeration survey.

Defendants do not agree, however, that a causal connection exists between the loss of political representation by the individual plaintiffs and the challenged conduct. Defendants argue that general populations shifts, over which defendants have no control, break the chain of causation. Thus, whether loss of political representation *is caused by* a statistical undercount of the 1990 census is a question that cannot be answered with any degree of certainty. Defendants also claim that because the alleged injury is indirectly the result of government action, a greater showing of causation is required. *Simon*, *supra*, 426 U.S. at 44-45, 96 S.Ct. at 1927.

As discussed earlier in the context of the injury requirement, defendants do not seriously dispute that plaintiff States and municipalities, of which the individual plaintiffs are citizens and residents, have a disproportionate minority population that is chronically undercounted. It is absurd to suggest that a disproportionate loss of political representation will not follow in the wake of a miscount. In addition, evidence submitted by plaintiffs suggests that defendants recognize this inevitable result. In a May 1987 memorandum to defendant Ortner, his executive assistant

advises that "states with large minority populations would benefit from an adjustment and states with small minority populations would lose [Congressional] seats." Bailar Affidavit, Exhibit 23. It thus appears quite evident from the record before me that the presence of this so-called independent variable--general shifts in population--has a minimal, if any, effect on the loss of representation as compared to the conceded inability to count that population accurately in the first instance. Moreover, it simply does not follow that, because the same result can be produced by two different variables, the separate effect of each variable on that result cannot be measured independently.

Accordingly, even using a higher standard to determine causation, the Court concludes that the alleged loss of political representation can fairly be traced to defendants' failure to employ a post-enumeration adjustment.

Based on the foregoing, the Court concludes that plaintiffs' standing adequately appears from the record. Accordingly, defendants' motion to dismiss on this ground is denied.

II. SUMMARY JUDGMENT AND STANDARD OF JUDICIAL REVIEW

Defendants also seek to dismiss the Complaint on the grounds that it fails to state a claim for relief under the Administrative Procedure Act ("APA"), and that pursuant to Rule 56, summary judgment is appropriate. The Court will not reach the merits of the summary judgment motion. Clearly, the motion is premature. Plaintiffs conducted scant, if any, discovery before defendants filed this motion. Moreover, in support of its motion, defendants filed a

woefully incomplete statement pursuant to Local Rule 3(g) asserting only conclusory issues of law. Defendants failure to carry their burden of identifying, in the Rule 3(g) statement, the *facts* it alleges are undisputed constitutes grounds for denying the motion. The Court will, however, address the question of judicial review.

Defendants maintain that the APA precludes judicial review of the Department of Commerce's determination not to correct the 1990 census because such a decision is committed to agency discretion by law. *See* 5 U.S.C. § 701(a)(2). Agency action based upon discretion falls beyond the pale of judicial review only when the action is based upon a statute that is drawn so sweepingly that a reviewing court has no "meaningful standard against which to judge the agency's exercise of discretion." *Heckler v. Chaney*, 470 U.S. 821, 830, 105 S.Ct. 1649, 1655, 84 L.Ed.2d 714 (1985). The statute upon which the Department of Commerce action is based, 13 U.S.C. § 141, provides that "[t]he Secretary shall ... take a decennial census of population ... in such form and content as he may determine." 13 U.S.C. § 141(a). Defendants believe that this statutory language gives the Secretary of the United States Department of Commerce unlimited and judicially unreviewable discretion to determine whether a post-enumeration adjustment for undercounting is appropriate.

A strong presumption exists that Congress intends judicial review of administrative agency action. *Bowen v. Michigan Academy of Family Physicians*, 476 U.S. 667, 670, 106 S.Ct. 2133, 2135, 90 L.Ed.2d 623 (1986). An exception to reviewability exists, in rare instances, when the agency action is committed exclusively to agency discretion

by law. *Citizens to Preserve Overton Park, Inc. v. Volpe*, 401 U.S. 402, 410, 91 S.Ct. 814, 821, 28 L.Ed.2d 136 (1971). In determining whether § 141 operates to foreclose judicial review, this Court is not writing on a blank slate.

In *Carey v. Klutznick*, *supra*, an action challenging the 1980 census, the Second Circuit explicitly rejected the contention that a federal court is precluded by operation of § 701(a)(2) from reviewing the Secretary's action. In so concluding, the Second Circuit stated: "[plaintiffs] allege an impairment of their 'right to a vote free of arbitrary impairment' ... a matter which cannot, of course, be foreclosed from judicial review by operation of the Administrative Procedure Act." *Id.* 637 F.2d at 838-39 (citations omitted). Numerous other courts have come to the same conclusion. *See, e.g., City of Willacoochee v. Baldrige*, 556 F.Supp. 551, 555 (S.D.Ga.1983); *City of Philadelphia v. Klutznick*, 503 F.Supp. 663, 674-75 (E.D.Pa.1980); *Young v. Klutznick*, *supra*, 497 F.Supp. at 1335; *City of Camden v. Plotkin*, 466 F.Supp. 44, 51-53 (D.N.J.1978); *United States v. Little*, 321 F.Supp. 388, 391 (D.Del.1971); *Borough of Bethel Park v. Stans*, 319 F.Supp. 971, 976-77 (W.D.Pa.1970), *aff'd*, 449 F.2d 575 (3rd Cir.1971); *West End Neighborhood Corp. v. Stans*, 312 F.Supp. 1066, 1068 (D.D.C.1970).

Defendants' attempt to depreciate the *Carey* decision, by citing more recent circuit and Supreme Court cases, is unavailing. Only one of the cases upon which defendants rely concerns a claim of constitutional magnitude. In that one case, *Webster v. Doe*, --- U.S. ---, 108 S.Ct. 2047, 100 L.Ed.2d 632 (1988), the Supreme Court held that a decision by the director of the Central Intelligence Agency to fire an employee based on his homosexuality was unreviewable

because it was made pursuant to a statute that committed such decisions to the director's discretion. The *Doe* court found that the decision was unreviewable pursuant to § 701(a)(2)--in other words, that plaintiff could not complain that his termination was not--as set forth in the statute--"necessary or advisable in the interests of the United States." *Id.* 108 S.Ct. at 2054. The Court also held, however, that plaintiff could seek review of constitutional claims arising out of the director's decision pursuant to that statute. Thus, the *Doe* court concluded that § 701(a)(2) did not foreclose consideration of plaintiff's claim that the director's action deprived him of his right to privacy, due process and equal protection.

The *Carey* court as well as the overwhelming majority of cases considering this issue, have concluded that § 701(a)(2) of the APA is inapplicable to the census statute. I am not persuaded that the reasoning of *Doe* changes that result. I thus conclude that the Court is vested with power to review the Secretary's decision not to adjust the 1990 census. I turn now to what standard I will use for that review.

Following the second bench trial on the merits of the various challenges made to the 1980 census, Judge Sprizzo in *Cuomo v. Baldrige*, 674 F.Supp. 1089 (S.D.N.Y.1987), determined that the arbitrary and capricious standard of review was appropriate. Judge Sprizzo found that it would be "wholly inappropriate ... to substitute [his judgment] with respect to the feasibility of an adjustment for that of the [Census] Bureau unless, at a minimum, the plaintiffs proved that the Bureau's determination was unreasonable." *Id.* at 1105. Buried in a footnote, plaintiffs attempt to argue that the arbitrary and capricious standard should not be used.

Surprisingly, plaintiffs make this assertion although their fourth claim for relief alleges that the failure to adjust the census is arbitrary, capricious, contrary to law and an abuse of discretion.

Courts that have previously entertained actions challenging the method of conducting a decennial census have consistently used the arbitrary and capricious standard. *See Cuomo v. Baldrige*, *supra*, 674 F.Supp. at 1105; *Carey v. Klutznick*, 508 F.Supp. 420, 429-430 (S.D.N.Y.1980); *City of Philadelphia v. Klutznick*, *supra*, 503 F.Supp. at 675-76; *City of Camden v. Plotkin*, *supra*, 466 F.Supp. at 52-53; *Borough of Bethel Park v. Stans*, *supra*, 319 F.Supp. at 977; *West End Neighborhood Corp. v. Stans*, *supra*, 312 F.Supp. at 1068. No serious argument has been advanced by plaintiffs that would require departure from this precedent. I thus conclude that the arbitrary and capricious standard as set forth in § 706 of the APA will guide my review of the Secretary's determination.

Plaintiffs, in the same obscure footnote, suggest that it is premature to decide the standard of reviewability at this early juncture. I disagree. An early determination of this critical issue is essential to enlighten the parties in their preparation for discovery and for future hearings.

III. WHETHER THE COMPLAINT STATES A CLAIM UNDER THE CONSTITUTION

The final issue is defendants' motion to dismiss the Complaint on the ground that it does not state a claim under the Constitution.

In *Carey v. Klutznick*, *supra*, 637 F.2d at 839, the Second Circuit, quoting *Wesberry v. Sanders*, *supra*, stated that Article 1, § 2 of the Constitution means that "'as nearly as practicable one man's vote in a congressional election is to be worth as much as another's ... and that our Constitution's plain objective [is to make] equal representation for equal numbers of people the fundamental goal.'" Plaintiffs' claim that the Secretary's decision not to adjust the enumeration results in an undercount and a loss of political representation necessarily arises under Article 1, § 2.

Defendants' quarrel is based on the language of 13 U.S.C. § 141(a), which gives the Commerce Secretary discretion to determine the manner in which the census is conducted. Defendants argue that the Secretary, after considering the relevant alternatives, acted rationally in deciding not to adjust. Transparently, this argument begs the question that plaintiffs raise--whether that decision was rational or whether it was arbitrary and capricious. Having made this challenge, plaintiffs have stated a claim under the Constitution. Whether they ultimately prevail, of course, is a matter that cannot be resolved now.

Accordingly, defendants' motion to dismiss the Complaint and their motion for summary judgment are

hereby denied. Plaintiffs may renew their motion for a preliminary injunction upon the completion of discovery.

SO ORDERED.

Dated: Brooklyn, New York
April 21, 1989

/s/ Joseph M. McLaughlin
JOSEPH M. McLAUGHLIN, U.S.D.J.

The Clerk shall make copies of this Order and shall serve them upon the parties.

DEPARTMENT OF COMMERCE

Office of the Secretary

[Docket No. 91282-1181]

Decision of the Secretary of Commerce on Whether a Statistical Adjustment of the 1990 Census of Population and Housing Should Be Made for Coverage Deficiencies Resulting in an Overcount or Undercount of the Population

AGENCY: U.S. Department of Commerce.

ACTION: Notice of final decision.

SUMMARY: This is a notice of the final decision of the Secretary of Commerce on the issue of adjusting the 1990 census to correct for overcounts or undercounts of the population in the 1990 Decennial Census. The purpose of this notice is to inform the public of the decision and to explain the basis for the decision.

DATES: The decision is effective on July 15, 1991.

FOR FURTHER INFORMATION CONTACT: Michael R. Darby, Under Secretary for Economic Affairs and Administrator, Economics and Statistics Administration, Room 4848 Herbert C. Hoover Building, United States Department of Commerce, Washington, DC 20230, Telephone (202) 377-3727.

SUPPLEMENTARY INFORMATION: The Secretary of Commerce is required, pursuant to 13 U.S.C. 141, to

conduct a decennial census of the population of the United States. The population totals derived from the census provide the basis for the apportionment of seats in the United States House of Representatives, for state legislative redistricting, for determining district boundaries for county and city elections, and for the allocation of federal funds to state and local governments.

In 1987, the Secretary of Commerce decided not to plan for a statistical adjustment of the 1990 census. As a result, a lawsuit was filed by the city of New York and other parties seeking to compel the Department to plan for such an adjustment. Pursuant to an agreement between the parties in *City of New York. et al. v. Department of Commerce. et al.*, 88-Civ.-3474 (E.D.N.Y.), the Department undertook a *de novo* review of the adjustment issue in order to make a decision no later than July 15, 1991, on whether to adjust the 1990 census. The purpose of this notice is to inform the public about the Secretary's decision and the basis for the decision.

Final guidelines which aided the Secretary in his decision were published in the **Federal Register** on March 15, 1990 (FR vol. 55, no. 51, part III pp. 9838-9861).[1] They were intended to provide the framework for a balanced consideration by the Secretary of factors relevant to the decision.

---

[1]Proposed guidelines were published in the **Federal Register** on December 11, 1989. The Court has previously considered and rejected a challenge to the guidelines. See *City of New York v. United States Department of Commerce*, 739 F.Supp. 767 (E.D.N.Y. 1990).

The census adjustment decision process was divided into several distinct phases. The first phase was the actual enumeration of the population. The second phase was the conduct of a post-enumeration survey, based on a probability sample of housing units. This sample provided data for two purposes: estimation of the net overcount or undercount of basic enumeration subgroups using capture-recapture methodology, and application of factors for the adjustment of the enumerated counts. The third phase of the process was a determination of the adequacy of the post-enumeration survey as an evaluation and adjustment tool. The fourth and final phase of the process was a decision on the adjustment question by the Secretary based on the published guidelines.

In making his decision, the Secretary relied on the advice of senior officials in the Economics and Statistics Administration, which includes the Census Bureau, as well as other senior advisors. The Secretary also relied on the individual recommendations of the eight members of the Special Advisory Panel appointed to provide independent advice to the Secretary on the adjustment question. In addition, the Secretary considered the public comments submitted to the Department pursuant to a **Federal Register** notice dated May 24, 1991, seeking comments on the question of whether the 1990 Census should be adjusted. The Department received approximately 650 public comments. These comments, as well as the appendices referred to in the following explanation of the decision, are available for public inspection in the U.S. Department of Commerce Central Reference and Records Inspection Facility, room 6020 Herbert C. Hoover Building, 14th Street and Constitution Avenue, NW., Washington, DC 20230.

Following is a detailed discussion of the adjustment decision and the basis for the decision. The discussion is in four sections: a summary statement, an analysis of the guidelines, an evaluation of the recommendations of the Special Advisory Panel and a statement of the decennial census procedures.

Dated: July 15, 1991.

Robert A. Mosbacher,
Secretary of Commerce.

SECTION 1--SUMMARY STATEMENT

Statement of Secretary Robert A. Mosbacher on Adjustment of the 1990 Census

Reaching a decision on the adjustment of the 1990 census has been among the most difficult decisions I have ever made. There are strong equity arguments both for and against adjustment. But most importantly, the census counts are the basis for the political representation of every American, in every state, county, city, and block across the country.

If we change the counts by a computerized, statistical process, we abandon a two hundred year tradition of how we actually count people. Before we take a step of that magnitude, we must be certain that it would make the census better and the distribution of the population more accurate. After a thorough review, I find the evidence in support of an adjustment to be inconclusive and unconvincing. Therefore, I have decided that the 1990 census counts should not be changed by a statistical adjustment.

The 1990 census is one of the two best censuses ever taken in this country. We located about 98 percent of all the people living in the United States as well as U.S. military personnel living overseas, which is an extraordinary feat given the size, diversity and mobility of our population. But I am sad to report that despite the most aggressive outreach program in our nation's history, census participation and coverage was lower than average among certain segments of our population. Based on our estimates, Blacks appear to have been undercounted in the 1990 census by 4.8%, Hispanics by 5.2%, Asian-Pacific Islanders by 3.1%, and American Indians by 5.0%, while non-Blacks appear to have been undercounted by 1.7%.

I am deeply troubled by this problem of differential participation and undercount of minorities, and I regret that an adjustment does not address this phenomenon without adversely affecting the integrity of the census. Ultimately, I had to make the decision which was fairest for all Americans.

The 1990 census is not the vehicle to address the equity concerns raised by the undercount. Nonetheless, I am today requesting that the Census Bureau incorporate, as appropriate, information gleaned from the Post-Enumeration Survey into its intercensal estimates of the population. We should also seek other avenues for the Bush Administration and Congress to work together and address the impact of the differential undercount of minorities on federal programs.

In reaching the decision not to adjust the census, I have benefitted from frank and open discussions of the full range of issues with my staff, with senior professionals from the Economics and Statistics Administration and the Census

Bureau, with my Inspector General, and with statisticians and other experts. Throughout these discussions, there was a wide range of professional opinion and honest disagreement. The Department has tried to make the process leading to this decision as open as possible. In that spirit, we will provide the full record of the basis for our decision as soon as it is available.

In reaching the decision, I looked to statistical science for the evidence on whether the adjusted estimates were more accurate than the census count. As I am not a statistician, I relied on the advice of the Director of the Census Bureau, the Associate Director for the Decennial Census and other career Bureau officials, and the Under Secretary for Economic Affairs and Administrator of the Economics and Statistics Administration. I was also fortunate to have the independent counsel of the eight members of my Special Advisory Panel. These eight experts and their dedicated staffs gave generously of their time and expertise, and I am grateful to them.

There was a diversity of opinion among my advisors. The Special Advisory Panel split evenly as to whether there was convincing evidence that the adjusted counts were more accurate. There was also disagreement among the professionals in the Commerce Department, which includes the Economics and Statistics Administration and the Census Bureau. This compounded the difficulty of the decision for me. Ultimately, I was compelled to conclude that we cannot proceed on unstable ground in such an important matter of public policy.

The experts have raised some fundamental questions about an adjustment. The Post-Enumeration Survey, which

was designed to allow us to find people we had missed, also missed important segments of the population. The models used to infer populations across the nation depended heavily on assumptions, and the results changed in important ways when the assumptions changed. These problems don't disqualify the adjustment automatically--they mean we won't get a perfect count from an adjustment. The question is whether we will get better estimates of the population. But what does better mean?

First, we have to look at various levels of geography--whether the counts are better at national, state, local, and block levels. Secondly, we have to determine both whether the actual count is better and whether the share of states and cities within the total population is better. The paradox is that in attempting to make the actual count more accurate by an adjustment, we might be making the shares less accurate. The shares are very important because they determine how many congressional seats each state gets, how political representation is allocated within states, and how large a "slice of the pie" of federal funds goes to each city and state. Any upward adjustment of one share necessarily means a downward adjustment of another. Because there is a loser for every winner, we need solid ground to stand on in making any changes. I do not find solid enough ground to proceed with an adjustment.

To make comparisons between the accuracy of the census and the adjusted numbers, various types of statistical tests are used. There is general agreement that at the national level, the adjusted counts are better, though independent analysis shows that adjusted counts, too, suffer from serious flaws. Below the national level, however, the experts disagree with respect to the accuracy of the shares

measured from an adjustment, The classical statistical tests of whether accuracy is improved by an adjustment at state and local levels show mixed results and depend critically on assessments of the amount of statistical variation in the survey. Some question the validity of these tests, and many believe more work is necessary before we are sure of the conclusions.

Based on the measurements so far completed, the Census Bureau estimated that the proportional share of about 29 states would be made more accurate and about 21 states would be made less accurate by adjustment. Looking at cities, the census appears more accurate in 11 of the 23 metropolitan areas with 500,000 or more persons: Phoenix, Washington, DC, Jacksonville, Chicago, Baltimore, New York City, Memphis, Dallas, El Paso, Houston and San Antonio. Many large cities would appear to be less accurately treated under an adjustment. While these analyses indicate that more people live in jurisdictions where the adjusted counts appear more accurate, one third of the population lives in areas where the census appears more accurate. As the population units get smaller, including small and medium sized cities, the adjusted figures become increasingly unreliable. When the Census Bureau made allowances for plausible estimates of factors not yet measured, these comparisons shifted toward favoring the accuracy of the census enumeration. Using this test, 28 or 29 states were estimated to be made less accurate if the adjustment were to be used. What all these tests show, and no one disputes, is that the adjusted figures for some localities will be an improvement and for others the census counts will be better. While we know that some will fare better and some will fare worse under an adjustment, we don't really know how much better or how much worse. If

the scientists cannot agree on these issues, how can we expect the losing cities and states as well as the American public to accept this change?

The evidence also raises questions about the stability of adjustment procedures. To calculate a nationwide adjustment from the survey, a series of statistical models are used which depend on simplifying assumptions. Changes in these assumptions result in different population estimates. Consider the results of two possible adjustment methods that were released by the Census Bureau on June 13, 1991. The technical differences are small, but the differences in results are significant. The apportionment of the House of Representatives under the selected scheme moved two seats relative to the apportionment implied by the census, whereas the modified method moved only one seat. One expert found that among five reasonable alternative methods of calculating adjustments, none of the resulting apportionments of the House were the same, and eleven different states either lost or gained a seat in at least one of the five methods. I recognize that the formulas for apportioning the House are responsive to small changes and some sensitivity should be expected. What is unsettling, however, is that the choice of the adjustment method selected by Bureau officials can make a difference in apportionment, and the political outcome of that choice can be known in advance. I am confident that political considerations played no role in the Census Bureau's choice of an adjustment model for the 1990 census. I am deeply concerned, however, that adjustment would open the door to political tampering with the census in the future. The outcome of the enumeration process cannot be directly affected in such a way.

My concerns about adjustment are compounded by the problems an adjustment might cause in the redistricting process, which is contentious and litigious enough without an adjustment. An adjusted set of numbers will certainly disrupt the political process and may create paralysis in the states that are working on redistricting or have completed it. Some people claim that they will be denied their rightful political representation without an adjustment. Those claims assume that the distribution of the population is improved by an adjustment. This conclusion is not warranted based on the evidence available.

I also have serious concerns about the effect an adjustment might have on future censuses. I am worried that an adjustment would remove the incentive of states and localities to join in the effort to get a full and complete count. The Census Bureau relies heavily on the active support of state and local leaders to encourage census participation in their communities. Because census counts are the basis for political representation and federal funding allocations, communities have a vital interest in achieving the highest possible participation rates. If civic leaders and local officials believe that an adjustment will rectify the failures in the census, they will be hard pressed to justify putting census outreach programs above the many other needs clamoring for their limited resources. Without the partnership of states and cities in creating public awareness and a sense of involvement in the census, the result is likely to be a further decline in participation.

In looking at the record of public comment on this issue, I am struck by the fact that many civic leaders are under the mistaken impression that an adjustment will fix a particular problem they have identified--for example, specific

housing units or group quarters that they believe we missed. It does not do so. It is not a recount. What an adjustment would do is add over 6 million unidentified people to the census by duplicating the records of people already counted in the census while subtracting over 900,000 people who were actually identified and counted. The decisions about which places gain people and which lose people are based on statistical conclusions drawn from the sample survey. The additions and deletions in any particular community are often based largely on data gathered from communities in other states.

The procedures that would be used to adjust the census are at the forefront of statistical methodology. Such research deserves and requires careful professional scrutiny before it is used to affect the allocation of political representation. Since the results of the evaluation studies of the survey were made available, several mistakes have been found which altered the certainty of some of the conclusions drawn by my advisors. The analysis continues, and new findings are likely. I am concerned that if an adjustment were made, it would be made on the basis of research conclusions that may well be reversed in the next several months.

It is important that research on this problem continue. We will also continue the open discussion of the quality of the census and the survey and will release additional data so that independent experts can analyze it. We must also look forward to the next census. Planning for the year 2000 has begun. A public advisory committee on the next census has been established and by early fall I will announce the membership of that committee. I have instructed the Census Bureau's Year 2000 task force to consider all options for the

next census, including methods for achieving sound adjustment techniques.

I give my heartfelt thanks to the many people who have devoted so much time and energy to this enterprise. The staff at the Census Bureau have demonstrated their professionalism at every turn through the last two difficult years. They executed a fine census and an excellent survey and then condensed a challenging research program into a few short months. I am deeply grateful for their help. Let me reiterate my sincere thanks to the Special Advisory Panel for their substantial contribution. The staff at the Department, especially those in the Economics and Statistics Administration, also deserve praise.

With this difficult decision behind us, we will commit ourselves anew to finding sound, fair and acceptable ways to continue to improve the census process. We welcome the leadership of Congress and other public officials, community groups, and technical experts in maximizing the effectiveness and minimizing the difficulties of the year 2000 census.

July 15, 1991.

SECTION 2--ANALYSIS OF THE GUIDELINES

Analysis of the Guidelines

Introduction

The 1990 census counts should not be changed by a statistical adjustment. This section explains my evaluation of the evidence relevant to each of the eight guidelines that I considered in reaching my decision. Each section begins

with a statement of the guideline and a reiteration of the explanation of the guideline contained in the March 15, 1990, **Federal Register** notice. A discussion of the guideline follows. The final section states my conclusions.

Summaries of my conclusions on each of the eight guidelines are set forth below.

Guideline One

Guideline One requires that convincing evidence be offered that the adjusted estimates of the population are more accurate than the census at the national, State, and local levels. In the absence of such evidence, the census counts are concluded to be the most accurate.

At the national level, it is likely that the PES-adjusted estimates reflect more accurately the total population and the racial and ethnic populations of the country. It appears equally clear, however, that the PES omitted large numbers of certain groups--notably black males. We have no information on the location of these persons. In addition, the PES and demographic analysis lead to sharply different conclusions about the accuracy of the census for several age/sex groups at the national level. Although these are not definitive disqualifiers at the national level, they do raise some question as to whether the adjusted figures are more accurate than the census count even at the national level.

The Constitution requires a census every 10 years not just to count the total number of people in the United States but to locate them so that political representation can be allocated to the states and the people in them in proportion to their numbers. I conclude that the primary criterion for

accuracy should be distributive accuracy--that is, getting most nearly correct the proportions of people in different areas. Improved numeric accuracy, although in itself desirable, cannot compensate for treating states and individuals less fairly.

At the State and local level the correct statistical analysis for both distributive and numeric accuracy simply has not been completed. The total error model indicates that the adjusted figures tend to be too high but generally closer in numeric terms to the true population than the census counts which tend to be too low. However, there is sufficient uncertainty about the true variance of the adjusted figures that even numeric accuracy has not been definitively demonstrated. The loss function analysis and hypothesis tests that have been prepared by the Census Bureau to date, although of uncertain reliability, do support the superior accuracy of the census counts versus the adjusted figures when we consider distributive accuracy--or fairness--and use reasonable estimates of the error variance of the alternative DSE. That is, for the Constitutional purposes of the census the available evidence is consistent with the census counts being more accurate than the adjusted counts. There is certainly not sufficient evidence to reject the distributive accuracy of the census counts in favor of the adjusted counts.

I conclude that, in accordance with Guideline One, the census counts are the most accurate count of the population of the United States at the State and local levels. While the preponderance of the evidence leads me to believe that the total population at the national level falls between the census counts and the adjusted figures, that conclusion is not relevant to the determination of distributive accuracy.

Thus this guideline weighs in favor of a decision not to adjust.

Guideline Two

I conclude that the considerations pointed to by Guideline Two tend to reject use of the adjusted figures and support use of the census counts. The adjusted figures--like the census counts--are consistent across all jurisdictional levels and of sufficient detail for all purposes. However, the adjusted figures do not appear to be of sufficient quality to be usable for reapportionment and redistricting. First, the distributive accuracy of the census counts is superior as concluded above in my review of the evidence on Guideline One. Furthermore, substantial evidence casts doubt on the homogeneity assumption underlying the entire synthetic adjustment methodology. Even if the tests discussed under Guideline One and based on the homogeneity assumption had proven favorable to adjustment, this evidence would weigh against adjustment. Instead, both considerations imply that the adjusted figures are not of sufficient quality to be usable for reapportionment and legislative redistricting. Thus, this Guideline weighs in favor of a decision not to adjust the census.

Guideline Three

I have previously concluded that the adjusted figures have not been shown to be more accurate than the census enumeration. That is all that is required under Guideline Three to conclude that the census may not be adjusted. There are, however, additional considerations under Guideline Three under which I also conclude the 1990 census should not be adjusted.

It has proved virtually an impossible task to prespecify the adjustment procedure. It is equally impossible to prespecify the Census procedure. However, in the adjustment procedure an individual or responsible group must make choices which have politically significant effects on the counts that can be transparent to those making the choices. This puts the counts at greater risk of being manipulated than the census. There is no evidence of unprofessional or political manipulation in the 1990 PES program.

The results of the adjustment procedure are broadly robust at an aggregate, national level. However, although various alternatives seem to distribute counts in roughly similar ways, small changes in methodology can move seats in the House. It is also true that small changes in the census enumeration can move seats in the House as well, but no individual involved in the enumeration process can predict how. That is not true for the decisions for adjustment that cannot be or were not prespecified.

One of the most problematic parts of the adjusted process was the bundle of statistical techniques contained in the smoothing process. These techniques relied heavily on statistical assumptions, resulted in large changes in adjustment factors, and may very well have led to an overstatement of the undercount. Thus, this guideline weighs in favor of a decision not to adjust.

Guideline Four

Based on the information available, I conclude that an adjustment would adversely affect future census efforts to a greater extent than any adverse effects of a decision not to

adjust. The evidence indicates that the controversy over adjustment is likely to have a negative effect on future censuses regardless of the outcome of the adjustment decision. I am concerned that an adjustment would reduce state and local support for future censuses, adversely affect the Department's ability to obtain appropriate funding for future censuses, adversely affect the quality of the work done in the future by temporary census enumerators who are essential in reaching the hard-to-count, subject the Census Bureau to partisan pressures, and create the possibility for political manipulation of future census counts. Thus, this guideline weighs in favor of a decision not to adjust.

Guideline Five

The question whether the chosen method of adjustment would violate the Constitution and federal statutes depends upon the substantive analysis of whether accuracy of the census is improved by an adjustment. Because there are other compelling substantive reasons not to adjust, legal considerations did not provide a basis for my decision.

Guideline Six

An adjustment to the census is a fundamental change in the way we count and locate the persons residing in the United States. I am deeply concerned that if an adjustment is made, it would be made on the basis of research conclusions that may very well be reversed in the next several months. That would be bad for the country and bad for the Census Bureau.

The results of the PES evaluation studies are not yet completely analyzed. Because of the compressed time

schedule imposed by the July 15 deadline, the analysis has not been subject to the full professional scrutiny that such important research requires and deserves. To the Census Bureau's great credit, the statistical tools used to calculate and evaluate the adjusted counts are at the cutting edge of statistical research. But such cutting edge research is not tried and true--it requires more thorough scrutiny before it can be used to affect the allocation of political representation and Federal funding.

Nonetheless, the demands of good research must be weighed against the need for a timely decision. In time we may find a way of combining the PES and the census to create counts that better reflect the absolute levels and the distribution of the population. There are sufficient data and analysis to support a decision not to adjust.

Guideline Seven

Any decision will result in some level of disruption through legal challenges. On balance, the record indicates that a decision to adjust would likely be more disruptive than a decision not to adjust. A decision to adjust would clearly cause disruption in those States that have early redistricting deadlines. The assertion that persons are denied their rightful claims without an adjustment assumes that the distribution of the population is improved by an adjustment. Based on the evidence, this assumption is invalid. Thus, this guideline weighs in favor of a decision not to adjust.

Guideline Eight

The requirements for this Guideline have been met. This Guideline does not weigh in favor of a decision either

way since the requirements of this Guideline could have been fully met if the decision had been to adjust.

Guideline One

The Census shall be considered the most accurate count of the population of the United States, at the national, State and local level, unless an adjusted count is shown to be more accurate. The criteria for accuracy shall follow accepted statistical practice and shall require the highest level of professional judgment from the Bureau of the Census. No statistical or inferential procedure may be used as a substitute for the Census. Such procedures may only be used as supplements to the Census.

Explanation

The mandate of the Census Bureau is to enumerate the population in a manner that assures that the count of the population is the best achievable given current methodology. As stated in the introduction, the assertion that a method involving statistical inference could lead to a more accurate enumeration warrants close scrutiny.

A set of adjusted counts would be based on a statistical inference that unaccounted for persons were present and that persons who were actually enumerated do not exist or were counted twice. Both determinations are based on a survey of a sample of similar blocks from locations across the country. Thus, the evidence, to be acceptable, must show convincingly that the count can be improved by statistical adjustment at national, state and local levels. In making this assessment, we will examine the

effects of the proposed adjustment on the accuracy of counts at all geographic levels.

Comparison of estimates of population size. The estimates of the size of the population from the original enumeration, the demographic analysis, and the post-enumeration-survey estimates will be compared to assess their consistency. The comparison will take into consideration the uncertainty inherent in the demographic analysis and post-enumeration-survey estimates. For the reasons explained in the introduction, the original enumerations will be considered to be more accurate for all geographic areas unless the evidence from demographic analysis and the post-enumeration survey demonstrates convincingly that the dual-system estimate is more accurate.

Accordingly, the Bureau of the Census shall carefully scrutinize and fully describe the size of any net undercount or net overcount inferred from demographic analyses of population sub-groups and the sources of any net undercount or net overcount of population subgroups inferred from the analysis of the post-enumeration survey.

Technical Grounds

Demographic Analysis. Estimates of the size of certain cohorts of the population are based on assumptions about or studies of the behavior of those populations. For some cohorts these assumptions have led to conclusions of net undercounts or net overcounts in several different censuses. The extent to which such conclusions result from specific assumptions will be described. Moreover, the extent to which these assumptions are warranted, and the sensitivity

of such conclusions to changes in these assumptions, will be assessed.

The potential sources of error in the demographic analyses the Bureau currently plans are:

Birth registration completeness.
Net immigration of undocumented aliens.
White births, 1915-1935.
Black births, 1915-1935.
Foreign-born emigrants.
Population over age 65.
Models to translate historical birth-record racial classifications into 1990 self-reported census concepts.

The Bureau will examine the effect of errors in each of these measurements on estimates of the net overcount or net undercount. These studies will yield ranges of uncertainty for the demographic estimates of the population which will in turn yield ranges of uncertainty for the net overcount or net undercount. The effect of uncertainty in each of these components will be cumulated into overall levels of potential error.

Post-Enumeration Survey. The capture-recapture method lies at the heart of the post-enumeration-survey models for estimating population coverage deficiencies. The use of this methodology to derive the net undercount or net overcount estimates will be clearly explained. The appropriateness of this methodology to the enumeration of the population will be assessed.

Like demographic analysis, the post-enumeration-survey adjustment mechanism relies on numerous assumptions. The extent to which these assumptions are warranted, and the sensitivity of the conclusions to changes in these assumptions, will be assessed.

Survey methods are based on randomly chosen samples that use statistical inference to estimate the population of the Nation and its components. Such estimates are subject to statistical variation within some range of values--that is, a replication of the process used to make the estimate (including taking the sample) may not lead to the same estimate as the original procedures. Thus, there is a likely range of estimates around the "true" count of the population that depends on the random sample chosen.

If the range of estimates likely to occur is small and near the "truth," then any particular estimate is close to the truth and, thus, acceptable as an approximation of the "truth." If the range is very large, then any particular estimate may not be close to the "truth," and the estimation process gives us little information about the "truth."

A relevant technical criterion related to uncertainty introduced by sampling is how small any possible range of dual-system estimates must be to conclude that any particular outcome of the dual-system estimation process is more accurate than the enumeration itself.

Because the post-enumeration survey itself is a sample, the quantified parameters of the deficiencies are themselves estimates and subject to statistical variability. This variability must be small enough to ensure that any

modification of the enumeration is an improvement over the unadjusted counts.

The post-enumeration survey serves two functions. The first function is to detect any deficiencies in the enumeration. For the post-enumeration survey to show convincingly that the enumeration is deficient, it must be clear that the deficiencies are not a result of problems in taking the post-enumeration survey. It follows, then, that the quality of the post-enumeration survey is a central concern in the decision whether to adjust.

The second function is to quantify any deficiencies attributed to the enumeration precisely enough to allow the enumeration to be modified in such a way that we are reasonably certain that the modified enumeration is more accurate than the original enumeration. Thus the post-enumeration survey must quantify the deficiencies of the enumeration precisely and accurately.

How much uncertainty in the measures of deficiency of the enumeration is acceptable?

(1) If the likely range of measures of deficiency would include outcomes that would call for no modification in the enumeration, then no modification would be done.

(2) The enumeration could be modified if the likely range of measures of deficiency would lead to potential modifications that would be substantially similar in terms of their impact on the counts of demographic groups, their impact on apportionment of Congress, and their impact on local population counts.

The quality of the net overcount or net undercount estimates that result from the post-enumeration survey depends on the quality of a series of operations used to gather and process the required data. The Bureau of the Census will undertake a series of studies to assess the statistical quality of the post-enumeration survey data. The results of these studies will yield measures of the precision and accuracy of the net overcount and net undercount estimates and a range of estimates for the net undercount and net overcount.

The current plans of the Bureau include investigation of the following sources of error for the dual system estimate of population size based on the post-enumeration survey and the census:

Missing data
Quality of the reported census day address
Fabrication in the P sample
Matching error
Measurement of erroneous enumerations
Balancing the estimates of gross overcount and gross undercount
Correlation bias
Random error

These and other component errors will be combined to produce an estimate of the overall level of error. In all evaluations, analyses will examine data for the population as a whole and for race, sex, Hispanic origin, and geographical detail.

Discussion

To certify a set of adjusted counts as the official counts of the population of the United States, one must accept the statistical inferences from a survey that there are persons who were unaccounted for by the census but who were actually present in a specific location on census day, that persons who were actually enumerated either did not exist or were counted twice, and that the same survey, when combined with census counts, can produce more accurate figures than the census enumeration alone. All these inferences are based on information from a sample of 377,381 persons in 171,390 housing units and group quarters in 5,290 block clusters. The people who are inferred to be missing from the census or erroneously enumerated in the census must then be correctly allocated to the specific blocks in which these mistakes were made. These blocks must be chosen out of the 4,830,514 inhabited blocks in the United States. Thus, acceptance of adjusted counts as more accurate requires not only that the counts themselves be shown to be more accurate, but that the distribution of those counts across the United States reflect more accurately the distribution of the population. This is the burden of proof imposed by Guideline One on any decision to adjust the census.

There are three population measurement techniques that play a role in making these statistical inferences. The first is the census enumeration. This was an effort to count each and every person residing in the United States on April 1, 1990. The second is the Post-Enumeration Survey (PES). This is the survey mentioned in the preceding paragraph that was taken several months after census day, independently of the census. An attempt is made to match the persons

surveyed in the PES back to records in the census and to match persons in the census to the PES. From the results of this matching process, and a complex web of statistical models, inferences can be made about the number of persons missed by the census and their location. It is the quality of these inferences that is at issue. The third technique is called demographic analysis (DA). DA makes an independent estimate of the population at a national level from administrative records. It can be used to calibrate the results from the census or PES. DA calculates the population from the number of births, number of deaths, the number of immigrants, and the number of emigrants. It builds up a count of the population of the United States from birth and death certificates, immigration records and other sources. Like the census and the PES, DA is also an imperfect measure, so the quality of the inferences made from it are in question as well.

In the course of the discussion of this guideline, various aspects of these three complex processes will be explained and discussed. A detailed explanation can be found in Section Four of this report. We begin by comparing the national counts found in 1990 using these three methods.

A Comparison of the Counts at the National Level Using Three Methods

The national total count from the census enumeration is compared, in Table 1, Appendix 14, with the corresponding total in the proposed adjusted counts based on the PES and also with the corresponding estimates based on DA. The census count is 2.07% or 5,269,917 persons less than the PES estimate. There is evidence of racial, ethnic,

and sex differential undercounts in the census when compared to the PES-based estimates. The count of black males in the census was 5.37% or 804,233 persons lower than the population inferred from the PES. The count of black females in the census was 4.33% or 715,543 persons lower than the PES estimated. For non-black males the census count was below the PES estimate by 2.02% or 2,205,443 persons and for non-black females the differential was 1.36% or 1,544,050 persons.

Estimates of national population totals are derived by DA based primarily on administrative records. Demographic analysis estimates provide national totals only and cannot be used to locate people as census counts are required to do. Many argue that the DA estimates broadly corroborate differential undercounts implied by PES-adjusted counts;[1] however, like the minority on the Undercount Steering Committee,[2] I find there are some important and puzzling differences. First, the overall undercount rate inferred from comparing the census to DA (1.85%) is smaller than that inferred from the PES (2.07%). At an aggregate level, the demographic analysis is thought to be more inclusive since

---

[1]See appendix 7: Bryant, Barbara E., Director of the U.S. Bureau of the Census, "Recommendation to Secretary of Commerce Robert A. Mosbacher on Whether or Not to Adjust the 1990 Census," June 28, 1991, [hereafter Bryant] page 16. See also Appendix 4, "Report of the Undercount Steering Committee," U.S. Bureau of the Census, June 21, 1991, [hereafter Undercount Steering Committee] page 4. See also Appendix 3: Ericksen, Eugene P., Estrada, Leobardo F., Tukey, John W., Wolter, Kirk M. "Report on the 1990 Decennial Census and the Post-Enumeration Survey," Members of the Special Advisory Panel, June 21, 1991, [hereafter Ericksen, *et al.*,] page 10.

[2]Undercount Steering Committee, page 4.

the PES and census will miss people who are difficult to survey. Thus the estimate of the population from the PES was expected to be lower than the DA estimate. It is not. The PES estimated total population is 0.23% higher than the DA estimate. More detailed analysis shows that the PES and DA estimates are not far apart in a statistical sense.[3] Nevertheless, the fact that the direction of difference is the opposite of what statistical experience would have led us to expect raises a troubling question about the relationship between the two methods.[4]

Another example of a gross inconsistency between the PES and DA is that an adjustment would add 1,055,826 more females than DA indicates should be added. If DA were in fact correct, and the enumeration were adjusted, the official population counts would have a 0.82% overcount of females imbedded in it.

The third disturbing comparison between the PES and DA undercount rates is that all groups of black males (except those aged 10-19) are substantially undercovered by the PES relative to DA. This results in PES-based undercount rates that are substantially smaller than the DA rates. This is the

---

[3]The 95% confidence interval for the overall PES undercount rate is from 1.23% to 2.20% and the judgmental 95% confidence interval for the overall demographic undercount rate is from 1.6% to 3.4%. A confidence interval gives the range of statistically plausible values. The "95%" refers to the notion that one is 95% sure this interval has captured the true, but unknown, value. See table 2 in appendix 14.

[4]As will be discussed later, there are measured biases in the production adjustment estimates. When corrections are made for these measured biases, the overall undercount rate measured by the PES falls below that of DA.

type of result that is usually expected in comparing the PES and DA.[5] An adjustment based on the PES would add 804,233 black males to the population. According to demographic analysis, the number of black males that should be added to the population is 1,338,380. Thus the PES-based adjustment would be omitting 534,147 black males according to DA. For black females the PES adjustment would add 29,390 fewer persons than DA indicates should be added. If we accept the DA as being closer to the truth, we could not appropriately add the persons the PES missed to the count because we have no way of locating them.

Some will argue that "going part way" toward remedying the undercount of black males is better than doing nothing.[6] The trouble with this argument is that it ignores the fact that increased accuracy for census counts means not only increased accuracy in the level of the population, but also increased accuracy in the distribution of the population in states and localities. In particular, for the primary uses of the census--apportionment and redistricting--the share or fraction of the total population in a given state, city or precinct is critical. It is this fraction that determines political representation and the amount of Federal funds

---

[5]The technical term for this is correlation bias.

[6]See Undercount Steering Committee, page 4; See also appendix 3: Ericksen, Eugene P. "Recommendation on 1990 Census Adjustment," Member, Special Advisory Panel, June 21, 1991, [hereafter Ericksen] page 2; See also Appendix 3: Estrada, Leobardo F. "Recommendation on 1990 Census Adjustment," Member, Special Advisory Panel, June 21, 1991, [hereafter Estrada] page 14; See also Appendix 3: Wolter, Kirk W. "Recommendation on 1990 Census Adjustment," Member, Special Advisory Panel, June 21, 1991, [hereafter Wolter] page 4.

allocated across political jurisdictions. The paradox is that even if you improve the accuracy in the level of the population in any given city by adding at least some of the people missed in the census, you do not necessarily improve and can worsen accuracy in the share of the population in that city. This point is explored further in the section on how accuracy is measured.

Special Advisory Panel Member Wachter estimates that the number of people missed by both the census and the PES may be as high as half-a-million.[7] We do not know where these people are.[8] The implicit assumption that we would be making if we went ahead and adjusted the count is that they are spread over the country in the same way as the post-adjustment population. Such an assumption has no empirical foundation. There is no doubt that there is a fundamental deficiency in the count, but there is also a fundamental deficiency in the PES. It is not clear that the adjusted counts will accurately reflect relative populations in particular jurisdictions. As Wachter states:

When we try to gauge the relative sizes of two states or cities or counties or districts [after an adjustment], we must always worry that there are enough more of the unreached in one than in the other to reverse the judgment about relative size that the adjusted counts would lead us to make.[9]

---

[7]See appendix 3: Wachter, Kenneth W. "Recommendations on 1990 Census Adjustment," Member, Special Advisory Panel, June 17, 1991, [hereafter Wachter] page 8.

[8]The implications of this for accuracy are explained at length below.

[9]Wachter, page 8.

To further complicate matters, at the national level there are instances where a PES-based adjustment to the census would move subpopulation totals in the opposite direction from that indicated by DA:

• An adjustment based on the PES will add 180,318 non-black males aged 10-19, while the DA indicates 136,908 should be deleted, a difference in the wrong direction of 317,226.[10]

• An adjustment based on the PES will delete 91,631 males over the age of 65, while DA indicates that 192,950 should be added, a difference in the wrong direction of 284,541 persons.[11]

• An adjustment based on the PES will add 375,053 females aged 10-19 when DA indicates that 7,141 should be deleted, a difference of in the wrong direction of 382,191.[12]

---

[10]The third table in appendix 14 shows that the 95% PES confidence interval for the undercount rate for this group is (0.53, 1.85) with a point estimate of 1.19. Demographic analysis shows a confidence range of (-1.21, 0.65) with a point estimate of -0.92. Thus neither estimate falls in the other's confidence range.

[11]The third and fourth table of appendix 14 show the confidence intervals for undercount rates for blacks and non-blacks separately. For non-blacks in this group, the confidence intervals for the two methods do not intersect, with the PES confidence interval completely less than zero and the DA confidence interval completely greater than zero. For blacks as well, the two intervals do not overlap. The PES spans zero, the DA is completely greater than zero.

[12]In appendix 14 the confidence intervals for this group are given for blacks and nonblacks separately. For non-blacks the intervals for the PES and DA do not overlap. For blacks they do.

• An adjustment based on the PES will delete 245,253 females over the age of 45 while DA indicates 146,255 should be added, a difference of 391,508 persons in the wrong direction.[13]

Another grouping of the population that plays a key role in the adjustment process is called a post-stratum. To calculate the adjusted population estimates, the population is broken down into 1392 groups called post-strata. Every individual in the United States fits into one, and only one, of these post-strata. These post-strata are based on census division, type of place of residence, tenure of residence, race, Hispanic ethnicity, sex, and age. These are the smallest groupings of people for which an undercount rate is estimated by the Census Bureau. When post-strata for similar types of persons are combined (for example, all post-strata with blacks, or all post-strata for people age 30-44) the results are largely consistent with expectations.[14] However, there is a lot of variation across the post-strata for similar types of people. Wachter offers intriguing evidence that "the story of census coverage, at a level of fine detail, is more complicated than one would hope."[15] For example, if one looks at all the post-strata for blacks, 25% of them show an overcount rather than an undercount.[16] Thus the broad, national-level aggregations of undercount by race,

---

[13]The confidence intervals for the four component groups are given in tables 1 and 2 of appendix 14. The intervals are wide enough that the differences may not be statistically significant.

[14]Wachter, pages 9-10.

[15]Wachter, page 10.

[16]Wachter, page 10.

ethnicity, sex, and age mask a large amount of diversity within those groups. It is therefore overly simplistic to conclude that the census generally results in an undercount for all members of any particular group.

This section has given an aggregate picture of the population using three different measurement instruments--the census, the PES, and DA. It is clear that the census suffers from an undercount, that the undercount is differential across race, ethnicity, and age, but that there is diversity within these groups. There are substantial and statistically different pictures of the population that are drawn by these three methods even at the national level. This is worrisome in and of itself. An adjustment based on the PES will be at face-value substantially different from our demographic estimates at the most aggregate levels. Whether it is an improvement depends not on its ability to add people and to subtract people from the census, but, rather, on its ability to add them and subtract them from the right places.

The Quality of the Census Enumeration

Special Advisory Panel Members Ericksen, Estrada, Tukey and Wolter all condemn the census as being fatally flawed.[17] I concede the census' imperfections, but the critical inquiry under this guideline is not how flawed the

---

[17]Ericksen, page 2; Estrada, page 2; See also Appendix 3: Tukey, John W. "Recommendation on 1990 Census Adjustment," Member, Special Advisory Panel, June 18, 1991, (hereafter Tukey), page 3; Ericksen, *et al.*, pages 4-9.

census is, but whether the PES can fix it.[18] Census taking is a complex task that must be completed within a short period of time. In an operation employing 350,000 temporary workers spread over more than 400 offices across the country, quality control is a real problem. The management information system the Census Bureau installed allowed the Census Bureau and the panelists to have access to the type of data panelists report. Thus, while identifying the flaws in the census is important for planning the next one, it simply begs the question that Guideline One poses: Is there convincing evidence showing that the adjustment is more accurate than the enumeration?

The Quality of the Alternative Measurement Tools

In considering whether to adjust the population for undercounts, the quality of the tools used to measure and then make an adjustment is important. The two methods that are alternative to the census are DA and the PES.

Demographic Analysis

Demographic analysis is a count of the aggregate population that is not based directly on any census. Instead it is built from administrative records including birth and death certificates, immigration records, and medicare records, among others. Limitations in record-keeping limit demographic breakdowns to those by age, sex, and black/non-black. There is no uniform reporting of ethnicity (*e.g.*, Hispanic origin) or the race of children of biracial couples. Even the same person might be reported as having

---

[18]Nevertheless, this was at least the second-best census ever conducted.

different characteristics on birth and death records. Because we do not keep records of movements of individuals within the United States this analysis can only be done at the national level.

Furthermore, demographic estimates of the population are continually being changed. No demographic estimates are ever final, as new sources of data and statistical models are used presumably to improve the inferences made about the population. (For example, as a result of the demographic analysis for this census, the estimates of the 1980 population were still being changed as late as last month.) This year the Census Bureau undertook a series of investigations into the quality of the demographic estimates. An important improvement in the estimates was the first attempt to characterize the uncertainty inherent in them with uncertainty intervals about the point estimates. These improvements are reported in the demographic reports D1-D11.[19] Because demographic analysis will not be used in any adjustment, any detailed discussion of its results is foregone. Nevertheless, it is worth noting that the uncertainty intervals have been used in the previous descriptions of consistency of the various estimates of the population.

In an article in *Science*, David Freedman, Professor of Statistics at the University of California at Berkeley, discusses the limitations of DA in some detail.[20] Racial

---

[19]See the executive summary of these evaluation projects in appendix 2.

[20]See Appendix 13: Freedman, David A. "Adjusting the 1990 Census," Science, Volume 252, May 31, 1991, [hereafter Freedman] pp. 1233-1236.

classification procedures vary widely. Incomplete coverage of vital statistics is a problem especially for certain age groups, with further variation by race and sex. In fact the census is used to adjust the birth certificate data that go into DA before DA is used to evaluate the census. Wachter also notes the complexity of DA,[21] and the fact that it is rightly subject to continual revision. He is particularly uncertain about the correctness of the estimates of immigration. He applauds the innovations in the 1990 DA, but quotes his colleague, Wolter, as saying: "The corrections that have been made are indicative of the corrections yet to be named."

The Post-Enumeration Survey and Dual-System Estimates

The Post-Enumeration Survey serves two related purposes. It is used as a measure of the accuracy of the census and it is used together with the census and statistical methods to generate adjusted counts. These adjusted counts are technically referred to as dual-system estimates (DSE). To evaluate the quality of the PES a series of 21 studies was done.[22] There are two questions that the Census Bureau intended to answer with the evaluation of the quality of the PES. First, whether the survey itself was of high enough quality in design and operation to be able to tell us something reliably about the faults of the census. Second, whether the adjusted counts or DSE were significantly more accurate than the census.

---

[21]Wachter, pages 14-16.

[22]See the executive summary of these evaluation projects in appendix 2.

The Quality of the PES Survey

The 21 Census Bureau studies were designed to address the issues of quality in the PES and the DSE, some in a quantitative way, some in a qualitative way. They generated volumes of data that have not yet been fully analyzed or understood. Nevertheless, they have generated the basic material on which a judgment must be made regarding a possible adjustment of the census and the effect of that adjustment on the accuracy of the census.[23] In addition some of the panelists did their own studies on various aspects of PES quality. The broad picture that emerges from the analysis of these studies is that the PES was a generally high-quality survey that was well-executed.[24] There is little doubt that the PES detected an overall undercount in the census and a differential undercount at the national level by race and ethnic origin. But there are some problematic areas and disagreements among experts inside and outside the Census Bureau that have an impact on assessing the quality of the adjusted counts generated from the PES.

Missing data. The PES generates its estimate of the undercount by trying to match households it has information about to households in the census. A household survey in the PES that is matched to the census record of that residence means there was no undercount of that household.

---

[23]Under Guideline Six, as explained later, "[i]f sufficient data and analysis of the data are not available in time to publish adjusted counts by July 15, 1991, a determination will be made not to adjust the 1990 census."

[24]See for example Ericksen, *et al.*, pages 12-16 for a good summary of the merits of the PES as a survey. Also see Wachter, page 2.

A non-match means there was an undercount. Matching is a difficult process and sometimes it is unclear whether there is a match or not. It is not an automatic process, rather it requires judgment and discretion. (For example, is a household headed by R. Smith the same as one headed by Bob Smythe?) Ideally, each household in the PES is matched or adequately resolved as not matched and thus missed in the census. Any case which is not resolved becomes "missing data" and, thus, whether those cases would add to or subtract from the undercount is unknown. The lower the missing data rate is, the more accurate the results are presumed to be. Three evaluation projects examined this problem.[25] In general, missing data were not found to be a serious problem;[26] however, there were two troubling findings. First, it is standard practice to impute persons into unresolved match households. The imputation rates for the two parts of the PES, called the "P" and "E" samples, were high: 1.7% and 2.1% respectively, which is equivalent to 3,900,000 and 5,025,000 individuals in the census when weighted up to the national population total estimate. These numbers are the same order of magnitude as the undercounts. Second, the percent of imputation in an evaluation stratum is highly correlated with the size of the undercount in that stratum. Thus, the strata for which there is more doubt about the quality of the adjusted data because of imputation tend to be the same strata for which an adjustment would result in large increases in the population.

Although Ericksen, Estrada, Tukey and Wolter do not find missing data or imputation to be a problem, Wachter

---

[25]See executive summaries of P1, P2, and P3 in appendix 2.

[26]Estrada, pages 11-13.

raises some basic questions about imputation.[27] The imputation scheme used for the PES is based on a series of assumptions that are mostly guesswork.

Given the assumptions, Wachter finds that this work is of high quality, yet he is hesitant to believe that these assumptions are necessarily valid. To get some idea of whether the assumptions are important he calculates strict upper and lower bounds on the effects of imputation.[28] This analysis shows that if the imputation assumptions were incorrect, the variation in the estimates could be well beyond that expected from sampling error alone. Thus these untested assumptions are critical. They may in fact be correct, but if they are not, the adjusted estimates may be significantly in error. This implies that the estimates in the adjusted counts are subject to more potential error than has been computed.[29]

Matching error. Highly accurate matching is important because matching errors in even a small percentage of cases can significantly affect undercount

---

[27]Wachter, pages 21-22.

[28]Wachter, page 22.

[29]In a letter submitted on July 11, 1991, Ericksen and Tukey dispute Wachter's concerns over imputation. Professor Wachter was offered an opportunity to respond in the interest of fair play. In his rebuttal letter, submitted on July 12, 1991, Wachter stands by his statements. Both letters are contained in Appendix 16. Wachter correctly notes that his claim was only that "a great deal rests on the correctness of the assumptions in the imputation," not that his alternatives were more reasonable than the ones used.

estimates.[30] Ericksen, Estrada, Tukey and Wolter find the matching process to be of high quality.[31] Although Wachter does not dispute that this is what the studies show, he believes that the estimate for the matching error is too low, because the rematch study "does not, by its nature, expose certain inevitable kinds of matching errors."[32] For example, he notes that the structured nature of the PES interviews could lead to inaccurate and inflated estimates for undercount rates. His evidence, though anecdotal, is suggestive of the fact that the variance due to matching error is conservatively estimated in the total error model.

Erroneous Enumerations in the Census. Erroneous enumerations include people who died before or were born after census day, fictitious people and pets listed as members of a household, twice counted people as well as people enumerated outside the PES matching area. There were a large number of erroneous enumerations in this census and they were differentially distributed. "While the national rate of erroneous enumerations was estimated at 5.4 percent, the rate for Blacks, Hispanics and central city Asians was 7.7 percent compared to 4.4 percent for all others. Minorities in central cities had the highest erroneous enumeration rate at 8.4 percent."[33] The Census Bureau studies indicate that the PES was good at detecting erroneous enumerations, although three processing offices show statistically significant

---

[30]Comments by Barbara Bailar. Journal of American Statistical Association. (March 19, 1985). Pages 109-111.

[31]Ericksen, page 13.

[32]Wachter, page 20.

[33]Ericksen, et al., page 8.

underestimates of erroneous enumerations.[34] The national effect of these errors is small, but the impact on regional totals is unknown.

Ericksen, Estrada, Tukey, and Wolter take the large number of erroneous enumerations as an indictment of the census.[35] Although it is certainly a matter of concern, especially for future census planning, the relevant question is whether the large numbers of erroneous enumerations would affect the accuracy of the proposed adjustment. Wachter considers this question at length.[36]

Erroneous enumerations and cases with insufficient information are not part of the usual statistical framework for dual-system estimation. Their modeling has received much less attention than the omission rates . . . The PES, however, turns out to show that erroneous enumerations account for a large portion of the variations in net undercounts across areas and post-strata. *This outcome very much complicates the task of understanding and assessing the adjustment process.*[37] [emphasis in the original]

The adjustment factor for a post-stratum is determined by the netting out of two kinds of errors in the census--in technical terms, gross omissions minus erroneous enumerations. One would hope that the predominant

---

[34]Estrada, pages 16-17; and the executive summaries of the evaluation studies P9 and P9a in Appendix 2.

[35]Ericksen, et al., pages 7-9.

[36]Wachter, pages 12-14.

[37]Wachter, page 11.

determinant of the adjustment would be the number of people missed in the census: areas with high miss rates get high adjustments. What Wachter demonstrates is that the erroneous enumerations--the number of extra people counted--are what is really driving the adjustment: areas with low duplication rates get high adjustments. For example, the three regions with the highest omission rates have very different adjustment rates. Like Wachter, I find it disturbing that "erroneous enumerations account for a large portion of the variations in net undercounts across areas and post-strata."[38]

As Wachter notes, Ericksen, Estrada, Tukey, and Wolter take the high levels of erroneous enumerations as evidence that coverage improvement programs were not finding real people but just adding fictional people to the count.[39] Wachter finds very mixed evidence on this question in comparing the counts in Detroit and Chicago. Late in the census enumeration, Detroit mounted an intense campaign to improve coverage, exceeding that mounted in Chicago. In the aggregate, Detroit did have a slightly higher erroneous enumeration rate, but a much lower omission rate. Thus, coverage improvement may very well have worked. However, for some categories of people, omission rates are roughly the same between the two cities, whereas erroneous enumeration rates are not. Thus, the evidence about coverage improvement is certainly more mixed than Ericksen, Estrada, Tukey and Wolter claim.[40] It is worth noting that Detroit

---

[38]Wachter, page 11.

[39]Ericksen, et al., pages 5-9 and Wachter page 12.

[40]Wachter, pages 12-13.

and Chicago are lumped together when adjustment factors are calculated, despite their sizable differences in coverage patterns.

Correlation Bias. To the extent that the PES misses the same people that the census misses it will underestimate the undercount. The technical term for this problem is correlation bias. There are several ways of assessing the extent of this problem, but the basic message given by all of them is the same. There is strong correlation bias in the PES, especially among black males.[41] Ericksen, Estrada, Tukey and Wolter tend to dismiss this problem by noting that the presence of correlation bias results in an underestimate of the undercount, so an adjustment at least goes part way toward solving the problem.[42]

However, the presence of large correlation bias poses a fundamental difficulty for the adjustment procedure. Since there is no way to observe these people directly, the adjustment estimator attempts to include an estimate of these people. They are often referred to as the "4th cell" since they appear in the 4th cell of a 2 by 2 table in which persons in a particular post-stratum are classified as being in or not in the census and in or not in the PES. Unfortunately we have no direct data to verify if the assumptions for estimating the 4th cell are met. One piece of data indicates there may be a problem we do not fully understand. Traditional wisdom has it that males are generally more subject to correlation bias, since past data support the observation that males are more likely to be missed in both

---

[41]See the discussion above.

[42]For example, see Estrada, page 14.

the census and the PES.[43] But, in 1990, about one-half of the people added to the estimate of the population from the 4th cell are women. Thus there is reason to doubt that the "fourth cell" numbers are correct. If that were the case the accuracy of the adjustment would be indirect.

One also expects that the number of people added to the adjusted population from the 4th cell should be small and that the estimate of the total population should be "lower than the truth." This is because no one expects that the estimate to fully reflect people missed in both the census and the PES. In past censuses, that has been the case. However, for 1990, the data are not consistent with past experience. Almost 5 million people were added to the estimate of the total population from the 4th cell, and the PES estimate of the total population exceeded the estimate from DA--a very unexpected finding.[44] Taken together, these findings indicate there may be problems in the adjusted count estimates that are not fully understood.

Wachter devotes several pages to the issue of correlation bias or as he calls it "catchability error."[45] His technical worry is that the allocation of this error to the model that measures the total error in the PES is done in an arbitrary fashion. Specifically, the national totals for black and for non-black males in six age groups estimated from

---

[43]See the discussion of hard to count groups in C.E. Citro and M. L. Cohen, eds., The Bicentennial Census, National Academy Press, 1985, Chapter 5, especially pages 177-186, and pages 224-237.

[44]See also the earlier discussion regarding the differences between DA and the PES at the national level.

[45]Wachter, page 18.

DA are divided by the corresponding totals for females. Under the assumption of no correlation bias for females, these ratios are then multiplied by the national totals from the adjustment estimate for females in each group to give the predicted total for males. The differences between these predicted totals and the totals for men given by the calculated adjustment are the resulting national estimates of unreached persons. The method assumes all unreached people are men. This allocation, which critically affects conclusions about the accuracy of the census, is not based on empirical evidence on the distribution of those persons not reached by either the census or the PES, but rather on a formula of convenience. There is no unique way of choosing an allocation scheme. The one chosen is not obviously bad, but whether it is good is speculative and has no basis in fact. Furthermore, the variation in the PES estimates contributed by correlation bias is computed for sex ratios in an "ingenious" but ultimately untenable fashion.[46] It uses the capture probability of those reachable by the PES and census to infer a capture probability for people who intend to evade both the census and the PES.[47]

---

[46]Wachter, pages 18-19.

[47]In their letter submitted on July 11, 1991, Ericksen and Tukey dispute Wachter's concerns over the consistency of DA and the PES. In his rebuttal letter, submitted on July 12, 1991, Wachter stands by his statements. Both letters are contained in Appendix 16. It is difficult to referee this dispute at the eleventh hour, especially since the lateness of the Ericksen/Tukey letter gave little chance for Wachter to prepare a detailed response. It seems however, that even given the recognized inability of the PES to reach certain black males, a PES-based adjustment would have more persons than demographic analysis would indicate. Now suppose, in fact, that one were to use the behavior of those captured by the PES to extrapolate to those missed by both surveys, as Ericksen and Tukey suggest. The estimate of the population would be, at least by

Wachter's argument over this technical point takes him back to a more fundamental point raised earlier, and also raised by Special Advisory Panel Members Kruskal and McGehee.[48] The PES is based on a statistical technique called "capture-recapture" which is often applied to estimating wildlife, particularly the number of fish in a pond. Fish are caught, tagged, thrown back and some are recaught in a second catch. An estimate of the population of fish can be made from the number of fish who are tagged on the second catch. The analogy made for the adjustment mechanism is that the census is the first catch and the PES the second. The analogy is not close, and it is not routine to adapt the wildlife model to counting the population.[49] The

---

Wachter's estimate, yet another half-a-million higher. Then the PES would exceed DA by well over a million people.

Ericksen and Tukey also take Wachter to task for asserting that "[t]here is no evidence we know of that indicates that a substantial proportion of those persons counted neither by the PES nor the census avoided being counted." Ericksen and Tukey have apparently overlooked a well known study by Valentine and Valentine that concludes "one cannot [always] expect traditional interview or self-enumeration procedures to identify individuals of the type missed in the study area. * * * [T]he men were not reported because identification * * * could be detrimental to the economic welfare of the household." Citro and Cohen, *op cit.* pages 236-37.

[48]See Appendix 3: Kruskal, William, "Recommendation to the Secretary on the Issue of Adjusting the 1990 Census," Member, Special Advisory Panel, June 13, 1991, [hereafter Kruskal], page 2; Wachter pages 18-20; and also Appendix 3, McGehee, J. Michael, "Report to Secretary Robert A. Mosbacher on the Issue of Adjusting the 1990 Census," Member, Special Advisory Panel, June 21, 1991, [hereafter McGehee], pages 8-12.

[49]Citro and Cohen, *op cit.*, page 147, make this point clearly.

problem that worries both Wachter and Kruskal is that, using the fishing analogy, some fish are harder to net than others.[50] There are, among fish, some "wily trout" which cannot be caught at all. Similarly some persons are harder to count than others, and some impossible.[51] For a variety of reasons they avoid the census and other forms of registration. The conclusions drawn about the population depend on what assumptions are made about these unreachable people. Different assumptions lead to widely differing results.

McGehee's concern about the application of capture-recapture is related to this notion of countability. The census and enumeration are both done by enumerators of varying skills, in different kinds of geographical areas (urban, rural, inner city, suburb) in an attempt to enumerate people who have different incentives to cooperate with the census or the PES. Thus there is inherent in the process a large variation in the probability of a particular person being enumerated in a particular place by a particular census worker. Further, to see if a person was counted both in the census and the PES a match has to be made--we do not tag people like we tag trout.[52] The ability of the matcher thus comes into play here. McGehee recognizes that there are elaborate mechanisms in place to control for all the potential variation, but many of those mechanisms depend on unverified statistical assumptions about what is important,

---

[50]Kruskal, page 3; and Wachter, page 18.

[51]See Citro and Cohen, *op cit.*, pages 139-142.

[52]Although often trout lose their tags which poses a similar conceptual problem.

and are changed after the data are in or after new research is completed.[53]

Total Error Model. An effort was made to produce estimates of expected error in the PES and variability of the estimates derived from the PES in project P16. This is generally referred to as the *total error model* since it was an attempt to combine the errors found in the PES by the other evaluation studies. These estimates of error cannot be made for any detailed groups. Instead, the population is divided into thirteen very broad categories called evaluation strata.[54] The estimates of errors for each evaluation strata are meant to be indicative of the uncertainties due to sampling error and all known components of non-sampling error. Whether the results of this study of large groups holds for smaller groups such as post-strata, states, cities or districts is unclear.[55]

This evaluation technique represents pioneering work on the part of the Census Bureau. It has been refined several times since the beginning of June, and every indication is that more refinements will be made as research on it is completed over the next several months. Nonetheless, some conclusions can be drawn from this project. On the one hand, the errors introduced by measured flaws in the PES process seem small. On the other hand, the model does show that the PES is biased toward

---

[53]McGehee, pages 8-12.

[54]A list of evaluation strata and their component post-strata are included in the Decennial Census Procedural Documentation, below.

[55]Wachter, page 16.

overestimating the undercount and that a bias-corrected estimate of the undercount would be about 1.4 percent rather than the production estimate of 2.1 percent. This means about a third of the net undercount adjustment in the DSE comes from bias in the PES.

Furthermore, the undercounts tend to be higher in the minority evaluation strata, as are the biases in the PES. Even after bias correction, the minority evaluation strata show statistically significant undercounts. Ericksen, Estrada, Tukey, and Wolter note that the shift in shares of each evaluation post-strata would be small if the production estimate were corrected for bias.[56] Wachter[57] expresses various concerns about the computation of the total error model and its components as does the minority of the Undercount Steering Committee.[58] The results of this model are used further in assessing the quality of the counts themselves.

The Quality of the Adjusted Counts

The fact that the PES was generally a high quality survey does not necessarily imply that it results in high quality adjusted counts. To the contrary, erroneous enumerations and correlation bias lead to the conclusion that there are serious doubts about the quality of the adjusted population estimates.

---

[56]Ericksen, *et al.*, page 15.

[57]Wachter, page 17.

[58]Undercount Steering Committee, page 6.

To understand the statistical issues involved in assessing the quality of the adjusted counts it is necessary to begin with a summary understanding of three measures of the population that the Census Bureau compared.[59] First there is the census enumeration. Second there are the adjusted counts or the production dual-system estimates (production DSE). Third there is an alternative DSE that corrects for biases found in the production DSE by examination of the evaluation of the PES in the P-studies. The third measure is used to judge the relative accuracy of the census and the production DSE. There are two main elements of concern: (1) whether to test the accuracy of population totals or of population distributions and (2) how such tests should be performed.

Should population totals or population distributions be compared? Acceptance of the PES measure of the national undercount as reasonable is only a necessary--not a sufficient--condition for it to be an adequate instrument to be used to adjust the actual enumerations. There has always been an undercount in the census. The central questions for the Constitutional and statutory purposes of the census are whether the undercount is evenly or differentially distributed across geographical areas and jurisdictions, and whether we know how to reduce the range of any differential undercounts. Indeed Congress has recognized this problem as well.[60]

---

[59]These measures will be explained more fully in the course of this discussion. The alternative DSE is also called the "target" population in Census Bureau documents.

[60]Subcommittee Chairman Thomas Sawyer, for example, noted that "If the undercount were evenly distributed geographically and demographically across the population, it probably would not pose the

These questions have not been squarely faced. For the most part, Census Bureau analysts concentrated on whether we know enough to reduce the errors in the numeric counts without regard to whether this increases or decreases the severity of differential undercounts across geographical areas or jurisdictions. That is, they interpreted accuracy as concerned with getting the number of people closer to the truth rather than getting the allocation of the population for the purposes of political representation and funding closer to the truth. The two do not necessarily go together.

An illustration of the problem with using the absolute criterion alone is useful. Suppose you observed an enumeration which missed exactly 5 percent of the people in each and every block. Thus, although 5 percent is missed in each and every block, the proportion of the total population in each block is still estimated correctly. Suppose now that you adjusted this enumeration by increasing the counts in half the blocks by 1 percent and increasing the counts in the other half by 5 percent. On average you would have reduced the undercount of the population by 3 percentage points thus, improving the numeric accuracy of the nationwide total. The numeric accuracy of the absolute level of the count also would have improved for each block. However, the block proportions would now be wrong. Half the blocks would be 2 percent too small and half would be 2 percent too large relative to the average undercount. The absolute criterion would prefer this type of adjustment even

---

problem that we confront here and the difficulty that we face in asking the Secretary to come to this decision." Hearing before the Subcommittee on Census and Population of the Committee on Post Office and Civil Service, U.S. House of Representatives, January 30, 1990. Serial no. 101-43. page 18.

though it moves from a situation in which every citizen gets his or her fair share of representation and funding to one in which every citizen got 2 percent too little or 2 percent too much.[61]

It is quite possible this kind of error could occur when the PES misses persons. The PES failure to include large numbers of black males in the adjusted counts could have caused just this kind of error. We simply do not know if it did.

I conclude that the Constitutional and legal purposes for the census must take precedence, and accuracy should be defined predominately in terms of getting the proportional distribution of the population right among geographical and political units. This argues for putting aside the judgment of accuracy based on getting absolute numbers right (numeric accuracy) and instead focusing on the question of whether there is convincing evidence that the accuracy of the population distribution in the adjusted numbers (distributive accuracy) is superior to the distributive accuracy of the actual enumeration. The quality of the adjusted counts themselves must be examined to address this important issue squarely.

What is the criterion for accuracy? Guideline One mandates that the census enumeration "shall be considered

---

[61]Kruskal gives a similar example on page 7 of his recommendation. See also Citro and Cohen, *op cit.*, page 318. "While synthetic estimation is suggested for adjustment, because of its arithmetic and computational simplicity, synthetic estimation is not necessarily an improvement over the census count." Cohen and Citro use a numerical example as an illustration.

the most accurate count of the population of the United States, at the national, State, and local level, unless an adjustment is shown to be more accurate." This guideline requires a series of statistical hypothesis tests at various levels of geography in which the adjusted counts are to be presumed less accurate measures of the population than the actual census enumeration unless there is convincing evidence that the adjusted counts are closer to the true counts than the actual enumeration.

The true population counts cannot be observed. However, classical statistics provides a standard way of approaching the required inference. In accordance with Guideline One, we take as a working (null) hypothesis that the actual enumerations in fact better characterize the true population. The adjusted counts are an alternative measure and the question is whether the available evidence permits us to reject the hypothesis that the census better describes the true population.

We shall see below that the Census Bureau has provided substantial (although not necessarily "convincing") evidence that the adjusted counts are more accurate if accuracy is interpreted to mean numeric accuracy. However, the evidence provided by the Census Bureau tends to support the superior distributive accuracy of the actual enumeration. Thus, since accuracy is interpreted in terms of the fairness of the implied distribution of representation and funds, the Census Bureau report supports the conclusion that the adjusted counts are not more accurate.

The choice of accuracy criterion is crucial because there appears to be a substantial national net undercount in the numeric census counts. Simply correcting for the

estimated net undercount can improve numeric accuracy but significantly worsen distributive accuracy. We can see that we missed people in most areas, but we lack a tool which can improve the distribution of population for the purposes of political representation and funding.

How are the tests of accuracy performed?

(a) The Census Bureau Loss Functions

The Census Bureau approach to testing the quality of the adjusted counts relies heavily on showing that the PES was well-executed and that the identified biases in the production Dual System Estimates or adjusted counts (DSE) are small relative to an "ideal" DSE. Unfortunately this type of validation methodology does not work in the present instance because of a basic design flaw: The DSE fits broadly into the class of "certainty-equivalent" predictors which use estimates as if they were known for certain rather than subject to statistical variation. A statistically optimal estimate of the population for an area would take account of this uncertainty.[62] Thus the conclusion that the measured

---

[62]The optimal estimate would average the ideal DSE estimate (based on the correct model and perfect data) with the actual enumeration with more weight being put on the actual enumeration when the model parameters are less precisely estimated. In point of fact, there are statistical theorems which demonstrate that even if the correct statistical model were known and perfect data were used, the Dual System Estimator (DSE) could generate adjusted counts which are either (1) clearly less accurate, or (2) not significantly more nor less accurate, or (3) clearly more accurate measures of the true population than the actual enumeration from the census. The question is which of these occurred? A textbook analysis of the suboptimality of the certainty equivalent approach is found in Arnold Zellner, An Introduction to Bayesian

shortcomings of the adjusted counts under consideration (the "production DSE") are small relative to the ideal DSE merely means that the production DSE has a chance of improving accuracy. It is unacceptable to go the next step and conclude that a good production DSE would be more accurate than the actual enumeration.

The production DSE are in fact less accurate than those ideal DSE because (a) the data were less than perfect, and (b) the correct model was not known. The bulk of the Census Bureau effort was aimed at seeing whether these data and modelling problems were disqualifying for the production DSE. It is clear that the production DSE are not unbiased estimates of the differential undercount rates and the DSE procedure overcorrects for the measured undercounts. This is measured in the total error model discussed above. These biases are quantified for thirteen large evaluation strata.

Using the total error quantification, the Census Bureau has generated an alternative Dual System Estimator of the population. It is worth noting here, that the errors in the production DSE are quantified for 13 very large groups of people. These errors are then "parcelled out" to the 1392 post-strata used to calculate an adjustment, the adjustment factors are corrected for these biases, and the alternative DSE is calculated. Since there are also estimates of variance

---

Inference in Econometrics, New York: John Wiley & Sons, 1917, pages 322-327. Intuitively, the problem arises because a full correction is attempted which is optimal only if one knows exactly the undercount or overcount in each area. As the actual uncertainty increases about exactly where and how many people were missed, attempts to make the full estimated correction increase the error variance relative to optimal and eventually, if uncertainty is large, relative to the unadjusted counts.

for the DSE, the Bureau actually calculates a statistical distribution of possible alternative DSE. A thousand random draws from this alternative distribution were used to generate estimates which the Census documentation terms "the target population." This is not the true population distribution--which is unobservable--but rather a tool for assessing the quality of production DSE counts relative to an "ideal" DSE based on more perfectly measured data and more correct models. But this hypothetical DSE is also just an estimator--subject to statistical error. So a correct analysis must account for two errors: (1) the error that comes from using the production DSE rather than the idealized DSE and (2) the error that is inherent in the idealized DSE. Then that combined error should be compared with the error in the actual enumeration.

To make matters even more complicated, legislative--and, now, judicial--representation must be apportioned and allocated over many levels of government into districts that treat their residents as fairly as practicable. Thus, comparisons must be made not only at the various levels of government on which funding is based, but down to the census blocks which are the basis for drawing district lines for Federal, State, and local elections. Unfortunately, the Census Bureau did not have the time to conduct the hypothesis tests required by Guideline One before the Undercount Steering Committee report was completed on June 21, 1991. The method they used instead to make these comparisons is called loss function analysis.

In brief, loss function analysis is used to compare two sets of counts for the same population. Ideally, one of the sets of counts is the true population, and thus the loss in accuracy from using the alternative set of counts is

measured. In practice, however, the truth is not known, so care must be taken in the interpretation of results. A loss function analysis can be performed at any level of geography--states, counties, cities, precincts, or blocks.

As an example, suppose a loss function analysis is being calculated for states. The difference between the two estimates of the population is calculated for each state. Then some kind of average is taken of the differences across all states to get an aggregate measure of total loss. The differences may be squared, summed and the total divided by the number of states. Alternatively, the absolute values of the differences may be averaged, where the average is weighted by the size of the state. There are an infinite number of formulas that can be used to average the state-by-state losses to get a single measure of total loss. These formulas are called "loss functions," and the results of any analysis can depend heavily on which loss function is chosen. For example, the loss function that uses squared differences penalizes a few large errors much more heavily than many small errors. The absolute value loss function does not have this property. The choice of a loss function is not scientific. It is usually made on the basis of convenience or tradition.

One more general comment on loss function analysis is needed. The loss function is ideally suited to measuring loss when an estimator of a population count is being compared to a known true count. In this case, the interpretation of the loss is straightforward. It is the accuracy lost by using the estimator. However, when one imperfect estimator is being compared to another, it is more difficult to interpret the loss of one estimate. The temptation is to call one estimator the "truth" and measure loss against

it. But one is not measuring loss against the truth. This is simply measuring loss of one estimate against another. There is no reason to think this analysis tells you anything about the truth. In loss function analysis, it is critical to consider the base being used for comparison--losses are measured only relative to that base.

The loss function analysis run by the Census Bureau asked whether the enumeration or the production DSE was closer to the "ideal" DSE.[63] This does not form a statistical test of whether the production DSE are more or less accurate than the census counts. It only calculates which set of numbers on average is closer to another set of estimates (the target population). These tests were simply not proper statistical tests to address the critical hypothesis about the distributive accuracy of the PES and the census enumeration.

Their examination of this closeness question erred further in two significant ways: (1) Instead of comparing the production DSE that would be used, they compared the mean of 1000 draws from a model reflecting the statistical properties of the DSE. This effectively eliminates the inaccuracies derived from using one particular set of adjustments. (2) Rather than using Guideline One's mandate that the actual enumeration be deemed more accurate unless the adjusted counts are shown convincingly to be more accurate, the Census Bureau did the reverse--they preferred adjusted counts if the actual enumeration was not proven

---

[63]This loss function analysis is described in detail in Undercount Steering Committee, pages 6-7; and Bryant, pages 12-14.

more accurate.[64] Thus the Census Bureau loss function analysis was seriously deficient.

There is, nonetheless, a June 27, 1991, Addendum to the Undercount Steering Committee report of June 21, 1991, that corrects some initial flaws in the loss function analysis.[65] This addendum attempts to correct for the error in failing to allow for the fact that the target population was itself an estimator subject to random variance. An allowance for this variance was removed from the variance charged to the census counts and estimates made of the number of states for which the population proportion would be made less accurate was generated. The number of state proportions worsened depends crucially upon the allowance made for variance in the alternative DSE: If only the variance measured in the total error model is used, then the shares of an estimated 21 states are made worse by adjustment (using an absolute value loss function).[66] However, this is clearly a minimum

---

[64]This last error may reflect the fact that the Census Bureau ignored the difference between the true population and its own approximate ideal estimator. See for example, the Undercount Steering Committee, page 2: "Time did not allow for full simulations of accuracy for smaller areas. There was some evidence from the loss function analysis, but there was no independent evidence with which to compare it. . . . Even so, in the absence of direct evidence to the contrary, the majority concludes that adjusted counts are generally more accurate at lower levels."

[65]A discussion of how this change affected the Undercount Steering Committee's conclusions is contained in the discussion of Guideline Six, below.

[66]See Appendix 5. Addendum to the Undercount Steering Committee Report, July, 1991. [hereafter Addendum], page 3. Given the original erroneous analysis, the Undercount Steering Committee report (page 6) was formulated when the committee thought the accuracy of only about

estimate. "As a matter of judgment, the total understatement of variance of the estimates from the smoothing model may be in the range of a factor of 1.7 to 3.0 in terms of variance," according to the Undercount Steering Committee.[67] Allowing for a variance factor of 2.0, which is near the lower end of the Undercount Steering Committee range, the proportional shares of about 28 or 29 states would be worsened by an adjustment in terms of distributive accuracy.[68]

Even with the variance factor set at only 1.0, adjustment is estimated to have worsened distributive accuracy compared to the census counts in 11 of the 23 metropolitan areas in cities with 500,000 or more persons: Phoenix, Washington, DC, Jacksonville, Chicago, Baltimore, New York City, Memphis, Dallas, El Paso, Houston, and San Antonio. Again using only the measured variance, half of the 14 metro areas in counties with over 500,000 persons are made less accurate proportionally by adjustment. Only aggregate measures are available for areas of other sizes. These show that on average the adjusted figures improve distributive accuracy relative to the census, but no detail is given as to the number of jurisdictions for which the PES is closer than the census. In all these sub-state cases, too, the estimated distributive accuracy of the adjusted figures deteriorates dramatically compared to the

---

11 states was worsened by adjustment.

[67]Undercount Steering Committee, page 5. The actual variance is believed to substantially exceed the measured variance because of doubts similar to those raised by Wachter for the matching and imputation procedures.

[68]Addendum, page 4.

census if the variance is increased to allow for the unmeasured uncertainty in the estimator.

In sum, the corrected Census Bureau estimates of distributive accuracy marginally favor the adjusted counts--though many states and communities would be less accurate--*if* only the measured variance is used. When the variance is increased into the plausible range (in the professional judgment of the Undercount Steering Committee), distributive accuracy comparisons are more favorable to the census counts.

It is worth reiterating that Guideline One specifically places the burden of proof on the adjusted estimates, not on the census. The census is considered to be more accurate unless the adjusted figures are shown to be more accurate. With respect to places under 100,000 population there is no direct evidence that adjusted counts are more accurate.[69]

---

[69]The Undercount Steering Committee report states "in the absence of direct evidence to the contrary, the majority concludes that adjusted counts are generally more accurate at lower levels," and later "while analysis was not available for smaller areas, the majority concludes that acceptable patterns would happen there also." (Undercount Steering Committee, page 2.). The reasoning is contrary to the explicit mandate of the guideline. Similarly the Director stated, "there is little evidence to judge whether the proportional distribution of adjusted counts is more accurate for places under 100,000. However, Loss Function Analysis shows that for metropolitan places of less than 25,000, 25,000-49,000 and 50,000 or more, and for nonmetropolitan places less than 25,000, and 25,000-49,000 in total, by these sizes categories, adjusted counts are more accurate than the census. However, there are concerns about the accuracy of the loss function assumptions for small areas." (Bryant, page 14.)

What evidence there was based its conclusions primarily on the numeric accuracy of the adjusted counts rather than the adjusted proportions, and that the Bureau depended upon indirect evidence rather than direct tests of statistical hypotheses.[70]

(b) Face validity tests

In addition to Loss Function Analysis computed by statisticians, demographers at the Census Bureau made an independent evaluation of the adjusted population counts for states. To do this they compared the adjusted state counts with counts simulated by DA. To make the simulations (because DA provides data only at the national level), they disaggregated census counts for each state by race and Hispanic ethnicity. They then applied DA national undercount rates to black and non-black subpopulations and PES rates to Hispanic and Asian and Pacific Islanders. Then they built up new state estimates by recombining the racial and ethnic groups. These simulated state estimates further confirmed the "face validity," or reasonableness, of the

---

[70]In a June 28, 1991, memorandum Senior Mathematical Statistician Robert Fay reports his efforts at conducting formal hypothesis tests of the distributive accuracy of the adjusted figures at the state level only. There was not time for the Undercount Steering Committee to review this memorandum and it may contain further errors. Nonetheless, although the hypothesis tests rejected the superior distributive accuracy of the census counts if only the measured variance was changed to the adjusted figures, the superior accuracy of the census counts was easily accepted for a variance factor of 2.0 and appears (by interpolation) acceptable at any variance factor in the Undercount Steering Committee's plausible range of 1.7 to 3.0.

adjusted state counts.[71] These face validity tests depend critically on what the analyst expects. Face validity tests certainly cannot be a substitute for formal tests, but just as face validity can be used to show that adjustment is making counts more accurate, face validity can show the opposite.

For example, is it reasonable that New Mexico has the highest undercount rate of any state? Why should the undercount rate for Montana be higher than that of New York State? How can the very low estimated undercount rates in cities like Philadelphia be explained? Of the large cities, only Washington, DC and Boston showed increases in their black populations between 1980 and 1990. Yet, Washington DC is estimated to have a very large undercount rate and Boston is estimated to have a very small undercount rate. Why are the only estimated overcounts for cities over 100,000 concentrated in New England? Why should Akron and Dayton have high estimated undercount rates (3.0% and 3.3%, respectively) and Cleveland have such a low estimated undercount rate (1.4%)? These examples illustrate as above the point noted above that was raised by Wachter earlier--there is much more texture to the pattern of undercount that lies well beneath the surface of any aggregate loss function analysis. Face validity cuts both ways. And the face validity of the proportions of persons in states and localities has not even been checked.

(c) Ericksen, Estrada, Tukey, and Wolter's claims regarding accuracy

These panelists take a different approach to the problem of accuracy of the counts at state and local levels.

---

[71]Bryant, page 14.

An article by Wolter and Causey attached to their jointly authored document[72] argues that accuracy improves, on average, at lower levels, so long as the measured undercounts at aggregate levels tend to have smaller errors than the original enumeration. In addition it is argued in a similar manner in an attachment to the joint report that Ericksen, Estrada, Tukey and Wolter submitted that adjusted counts will on average improve block level data (and thus data for localities) consistent with its improvement of data at larger units of geography.[73] Thus their argument asserts that by applying the total error model to the 13 evaluation post-strata, the PES is shown to be more accurate than the census and the error in the PES is shown to be low. They conclude, based on the theoretical argument by Tukey and the empirical argument made by Wolter and Causey, that

a. The total combined error increases as the size of the group decreases; *e.g.*, the combined errors for 5 million blocks will be larger than the combined errors for 1392 post-strata.

b. Consequently, the improvement in amount due to adjustment will be nearly the same for larger and smaller groups, the improvement in percentage terms decreases, but does not change sign, as the groups become smaller.[74]

Ericksen, Estrada, Tukey, and Wolter note that these conclusions depend on a particular measure of combined

---

[72]See appendix G of Ericksen, *et al.*

[73]See appendix F of Ericksen, *et al.*

[74]Ericksen, *et al.*, page 20.

error--a loss function that uses a size-weighted sum of relative error. Their primary point is that, with such an error measure, conclusions about local accuracy can in fact be drawn from accuracy conclusions at larger levels. In short, they contend, "improvement in quite large areas thus prophesies improvement in very small areas, as well as a variety of intermediate levels." They see a post-enumeration survey with small measured error (and some, like Wachter and the Undercount Steering Committee contend that such error is very conservatively measured) for thirteen large evaluation strata. They conclude that the adjusted counts for these large evaluation strata are more accurate--a questionable inference because they made no formal statistical test of this hypothesis. From this questionable conclusion they apply mathematical theory to infer *average* accuracy improvements at lower levels.

In testimony before Congress, an official of the General Accounting Office raises some questions on the issue of sampling error and lower level geographic accuracy:

We believe the amount of sampling error, or variability, deserves attention by the Secretary because it was a consistently high source of uncertainty in the PES over-and undercount estimates. The PES estimates are based on samples and therefore subject to random error. The levels of sampling variation measured by the evaluations of the PES were generally much higher than anticipated by the original design of the PES. For example, even after smoothing to reduce sampling variability, PES over- and undercount estimates for 4 of the 13 evaluation groups did not show a statistically significant difference from the census count. In other words, due to the variability resulting from doing a sample, *the Secretary cannot be sure whether 4 of*

the 13 population groups reviewed in the Bureau's evaluation of total error in the PES were overcounted by the census, undercounted, or if the census count was correct. (emphasis added)

The need for precision is especially important because the Bureau's procedure for carrying down PES adjustment factors to lower geographic levels applies the same adjustment factors to large numbers of people over wide geographic areas with similar demographic characteristics.[75]

The Wolter/Causey paper does not address this argument directly. In addition, Wachter argues cogently against indiscriminate use of the Wolter/Causey paper:

Theirs is a very interesting paper, but its relevance is limited by its concentration on highly aggregated summary measures of improvement. It does not present explicit results on how many units at various levels might be made worse and how many made better by an adjustment. Furthermore, important calculations in the paper depend on stylized assumptions about correlations in the components of the undercount which may or may not hold in fact either for previous PES-like data or for the 1990 PES. These prior studies are valuable, but they are no substitute for examination of the actual 1990 data.[76]

---

[75]See appendix 17. General Accounting Office. "1990 Census: Applying PES Results and Evaluations to the Adjustment Decision." Testimony before the Subcommittee on Census and Population, Committee on Post Office and Civil Service House of Representatives. [hereafter GAO Report]. Pages 7-8.

[76]Wachter, page 27.

There are fundamental difficulties with the Wolter/Causey argument. I am not convinced that at the evaluation strata level we can conclude the PES is more accurate. First, the measured bias alone is one-third of the total undercount and the Undercount Steering Committee itself stated that there are other non-measured sources of error.[77] Wachter also raises several fundamental concerns about this measurement. Second, the analysis depends on a particular loss function that weights a few large relative errors more than many small ones. This is not inherently bad, just arbitrary.[78] Wachter perhaps summarizes it best:

I do not believe that any highly aggregated index or loss function is appropriate for summing up overall accurary. It is informative to understand how much the outcomes of calculations with different versions of such aggregated indices differ. But the choice among them is not a scientific choice. Each such index involves implicit value judgments about different sorts of error. For example, each index determines whether a few large errors are more serious that a great many smaller errors. *Whether we agree with a particular tradeoff is a matter of personal and political values. It should not be disguised as science.*[79] [emphasis in original]

Loss functions mask the incredible complexity of the adjustment operation behind a single number. To get a

---

[77]Undercount Steering Committee, page 5.

[78]Indeed, Ericksen, Estrada, Tukey, and Wolter make no claim of uniqueness for their choice of loss function. As noted earlier, the choice of loss function can control the results of an evaluation.

[79]Wachter, page 5.

glimpse of this complexity, it is useful to look at the undercount rates by state. Table 1 and Figure 2 of Appendix 10 show the undercount rate by state with margins of error. Counting the District of Columbia as a state, 42 of the 51 states show an undercount rate that is statistically significant. More importantly, however, is how these undercount rates differ from the national average, since it is these differences that determine which states win and which lose. Table 6 and Figure 1 of Appendix 10 show these differences again with margins of error. Only 18 of the 51 states have an undercount rate that is significantly different from the national average. That means in 33 states we do not know if the undercount rate is higher, lower or the same as the national average. Put another way, we do not know if these 33 states deserve more or less political representation and Federal funding than they are receiving. We do not know for these 33 states if an adjustment would result in a more equitable distribution of political representation and resources.

There are winners and losers from an adjustment--that is to be expected whenever a fixed set of resources is going to be divided. More seriously, however, there is general agreement that there will be some localities' counts that will be made less accurate by an adjustment. The proponents contend that, on average, more areas are made accurate, or more people live in areas whose counts are more accurate, or on average the counts are more accurate. These are all vague and general statements that do not describe the areas of the country where accuracy is likely increased and decreased, the types of towns where accuracy is likely increased and decreased, the neighborhoods where accuracy is likely increased and decreased. We have already seen above that general statements about improved accuracy on

average are little if at all justified if realistic values are used for the error variance of the alternative DSE. Furthermore, the rhetoric, if not always the analysis, is centered around absolute levels of the counts, not improvements in the distribution of the counts.

Conclusions

Guideline One requires that convincing evidence be offered that the adjusted estimates of the population are more accurate than the census at the national, State, and local levels. In the absence of such evidence, the census counts are concluded to be the most accurate.

At the national level, it is likely that the PES-adjusted estimates reflect more accurately the total population and the racial and ethnic populations of the country. It appears equally clear, however, that the PES omitted large numbers of certain groups--notably black males. We have no information on the location of these persons. In addition, the PES and demographic analysis lead to sharply different conclusions about the accuracy of the census for several age/sex groups at the national level. Although these are not definitive disqualifiers at the national level, they do raise some question as to whether the adjusted figures are more accurate than the census count even at the national level.

The Constitution requires a census every 10 years not just to count the total number of people in the United States but to locate them so that political representation can be allocated to the states and the people in them in proportion to their numbers. I conclude that the primary criterion for accuracy should be distributive accuracy--that is, getting most nearly correct the proportions of people in different

areas. Improved numeric accuracy, although in itself desirable, cannot compensate for treating states and individuals less fairly.

At the State and local level the correct statistical analysis for both distributive and numeric accuracy simply has not been completed. The total error model indicates that the adjusted figures tend to be too high but generally closer in numeric terms to the true population than the census counts which tend to be too low. However, there is sufficient uncertainty about the true variance of the adjusted figures that even numeric accuracy has not been definitively demonstrated. The loss function analysis and hypothesis tests that have been prepared by the Census Bureau to date, although of uncertain reliability, do support the superior accuracy of the census counts versus the adjusted figures when we consider distributive accuracy--or fairness--and use reasonable estimates of the error variance of the alternative DSE. That is, for the Constitutional purposes of the census the available evidence is consistent with the census counts being more accurate than the adjusted counts. There is certainly not sufficient evidence to reject the distributive accuracy of the census counts in favor of the adjusted counts.

I conclude that, in accordance with Guideline One, the census counts are the most accurate count of the population of the United States at the State and local levels. While the preponderance of the evidence leads me to believe that the total population at the national level falls between the census counts and the adjusted figures, that conclusion is not relevant to the determination of distributive accuracy. Thus this guideline weighs in favor of a decision not to adjust.

Guideline Two

The 1990 Census may be adjusted if the adjusted counts are consistent and complete across all jurisdictional levels: national, State, local and census block. The resulting counts must be of sufficient quality and level of detail to be usable for Congressional reapportionment and legislative redistricting, and for all other purposes and at all levels for which census counts are published.

Explanation

This guideline acknowledges that the population counts must be usable for all purposes for which the Census Bureau publishes data. The guideline also reinforces the fact that there can be, for the population at all geographic levels at any one point in time, only *one* set of official government population figures.

Thus, the level of detail must be adequate to produce counts for all such purposes. If the 1990 Census count is to be adjusted, it must be adjusted down to the census block level. It must be arithmetically consistent to eliminate confusion, and to prevent any efforts to choose among alternative sets of numbers to suit a particular purpose.

If the Census is to be adjusted, a process called synthetic adjustment will be used. A synthetic adjustment assumes that the probability of being missed by the census is constant for each person within an age, race, Hispanic origin, sex, and tenure category in a geographical area. A synthetic adjustment is performed in two steps. First, the preferred adjustment factors are estimated for a variety of post strata defined by age, race, Hispanic origin, sex, and

tenure within geographic areas. Then the adjusted estimate in each category for a census block is obtained by multiplying the unadjusted census estimate in that category by the adjustment factor. The adjusted census estimate for the census block is computed by adding the estimated adjustments for each post strata cell of the block. Put simply, in an adjusted population count each individual enumerated will receive a relative weight according to his or her race, age, sex, ethnic background, tenure, and place of residence. The aggregate counts will then be built up from the weighted individuals to census block, local area, state and national counts.

We will conduct evaluations of small area estimations to ensure that this process results in counts that are in fact more accurate.

Evaluations of small area estimation. Coverage error may vary substantially within the post-enumeration-survey post-strata, although the post-strata were drawn to be homogeneous with respect to expected coverage error. The goal of this analysis is to determine whether or not the assumptions underlying a synthetic adjustment of the census are valid and produce counts which are more accurate at all geographic levels at which census data are used. In particular, the within-strata block-to-block variance in characteristics and net overcounts or net undercounts will be analyzed.

Discussion

If I had determined that an adjustment should have been undertaken, the Census Bureau would have issued block-level Public Law 94-171 tapes that would have

replaced those issued in the first three months of this year. Replacement Summary Tape File (STF) data would have also been issued and all future census products would have used adjusted counts. Our ability to have done so would have satisfied the production requirements of this guideline.

The substantive question here is whether the adjusted counts are of sufficient quality to be used for all purposes for which census counts are published. Clearly the quality of the adjusted figures is intimately related to their accuracy, which, as the discussion of the preceding Guideline shows, does not compare favorably with the actual enumeration. This Guideline raises another issue--synthetic adjustment.

As explained earlier, the adjustment process uses a survey of persons in 5,290 block clusters to change the number of people in 4,830,514 blocks. Based on extrapolation from this survey 6,188,204 unidentified persons are added by duplicating records of people counted in the census, and 918,937 people who were actually counted in the census are deleted. The adjustment process is done by dividing the population of the country into 1392 groups. Each member of one of these groups is assumed to have the same probability of being missed in the census as every other member of that group. The real quality of the census in a given block or even a given city has little impact on the adjustment of the count of the population of that block or that city. As will be seen in the discussions of Guidelines Seven and Eight, most local officials think that the adjustment will fix particular problems that they have identified in the count for their towns. It would do no such thing.

A synthetic adjustment assumes that the probability of being missed by the census is constant for each person within an age, race, Hispanic origin, sex, and tenure category in a geographic area. These groupings of persons are called post-strata. A synthetic adjustment is performed in two steps. First, the preferred adjustment factors are estimated for 1392 post-strata. Then the adjusted estimate in each category for a census block is obtained by multiplying the unadjusted census count in that category by the adjustment factor. The adjusted census estimate for the census block is calculated by adding together the estimated adjustments for each post-strata represented in the block. Because of the problems of correcting a census with a survey, adjusted figures cannot be more accurate than the census counts in each of the 4,830,514 occupied blocks, or at all larger aggregations of them. There is no PES system--short of one which took a second perfect census--that could say adjusted counts are more accurate for all blocks. The question is whether the assumptions that underlie this synthetic adjustment mechanism are good enough to conclude that the counts are sufficiently accurate to be usable at a block or precinct level.

As noted above, the synthetic adjustment process rests on the assumption that persons in each post-stratum are homogeneous with respect to their probability of being missed by the census, *i.e.*, their capture probability. This is admittedly a very difficult thing to measure. There were several approaches taken by the Census Bureau to validate the homogeneity assumption, all contained in project P12.

The first part of P12 collapsed the 1392 post-strata by age and sex into 116 larger groups. To test whether the people living on blocks within these 116 larger post-strata

are homogeneous with respect to capture probability, the Census Bureau conducted an analysis of the homogeneity of 115 of the 116 larger post-strata (the 116th is persons living on Indian reservations). A regression model predicted an adjustment factor for block parts, then compared that with an adjustment factor of 1.0 (no adjustment) representing the numeric census counts. This predicted adjustment factor was also compared with the measured factor for the post-strata used in creating the adjusted counts. For 24 of the 115 post-strata the census count was superior while for 91 post-strata the adjusted count was superior in terms of numeric accuracy. The Director interprets these findings to "give support to the accuracy of the selected PES adjustment model."[80] Regrettably, this evidence does not directly address the homogeneity issue. Like the uncorrected loss function studies this simply compares the census and the PES to yet a third estimate (the regression equation) whose quality or closeness to truth is unknown. This cannot be called a test or even a verification of the homogeneity assumption. To pursue this approach, allowance should have been made for the true variance in the regression estimates in a manner analogous to that done in the Undercount Steering Committee Addendum for the target population. It must be understood that such errors can easily occur when cutting edge research is used for production purposes under extreme time pressure.

The second part of P12 analyzed the homogeneity of state parts within post strata. Techniques known as analysis of variance were used to determine the validity of using post-strata, rather than states, for estimation of adjustment factors. The study was designed to determine if there was

---

[80]Bryant, page 18.

relatively more homogeneity within state or within post-strata. The study showed that, with the exception of the Mid-Atlantic Division, state differences were not significant within post-strata. This result was compatible with the conclusion that there is relative homogeneity for state parts within post-strata. There is no evidence of homogeneity for other geographic levels.[81] The only conclusion that can be drawn from this study is that the Census Bureau was better off using the actual post-strata for synthetic estimation than using any state-specific effects. Whether the levels of homogeneity within post-strata are acceptable is not even addressed.

The third part P12 looked at state homogeneity from a different vantage point. It measured whether other factors that are often correlated with undercounting are homogeneous within post-strata. Contrary to the results of the second part of the studies, these factors showed significant heterogeneity by state within post-stratum for well over 80% of the post-stratum groups. This study went further and measured the homogeneity of some of the components of the dual-system estimates at the block level and found about 14% of the post-strata groups to have significant state effects. Thus, the evidence in this study for the presence or absence of homogeneity within post-strata is mixed.

In summary, the analysis presented for decision from P12 was substantially different from that planned by the

---

[81]The Undercount Steering Committee report states that a majority of the Undercount Steering Committee believe this result would hold for other geographic levels. However, there is no evidence presented to support this. Undercount Steering Committee, page 2.

Census Bureau and used only the State as a surrogate for heterogeneity. We clearly do not thoroughly understand whether or not heterogeneity is a real problem. There are indications that using post-strata for synthetic adjustment is better than using states, but nothing more. It is impossible to conclude from any information the Bureau has presented in P12 that there is not residual heterogeneity within post-strata.[82]

Project P15 approaches the homogeneity problem by attempting to measure the quality of the dual system estimates by examining their expected variability. The measure used to do this is called the coefficient of variation which is the ratio of the sample standard deviation to the sample mean. The PES was designed so that these coefficients of variation were expected to be equal to 0.7 percent for the areas used in the design. In fact, in 48 of the 54 areas examined, the actual coefficients of variation are larger than expected. They ranged from 0.45 percent to 4.4 percent. This is direct evidence of substantially more variability in the DSE than expected and indirect evidence of heterogeneity within post-strata.

---

[82]Estrada agrees that the findings from P12 are mixed, although his conclusions differ from mine: "It supports the fact that PES poststrata are homogenous with respect to expected coverage error, but also questions the homogeneity of the division level poststratum. These findings lend support to the accuracy of the adjusted count based on the synthetic method particularly within poststrata and block-to-block variance in characteristics and net overcounts and undercounts. Overall, 79 percent of the time the adjusted count is better than the census count. Nonetheless, this research 'flags' the need to be aware of State effects." (Estrada, page 19.) Given the fact that reapportionment depends critically on state counts, Estrada's conclusions raise a large flag in terms of accuracy.

Other arguments have been made about this guideline. As noted in the analysis of Guideline One, Ericksen, Estrada, Tukey, and Wolter rely heavily on the Wolter/Causey/Tukey argument that synthetic adjustment will increase the accuracy of the counts.[83] For the reasons explained in the discussion of Guideline One, I do not find this argument compelling. Its reliance on the unsubstantiated homogeneity assumption simply emphasizes the concerns raised earlier.

Estrada argues that it is not necessary to show that the adjusted counts have to be better for all purposes, if it is shown on average to improve counts for its principal uses. "Improved counts to meet Constitutional needs for reapportionment and redistricting would be sufficient justification to adjust, even though for some other uses adjusted counts are less valid."[84] I do not consider this argument persuasive. Reapportionment and redistricting counts are the most demanding in terms of accuracy because block level counts are required to accomplish both.[85] If adjusted counts are better for these purposes, then they would necessarily be better for all others.

McGehee asserts that "variances between processing offices and evaluation strata fall outside expected levels in a number of the evaluation studies. At the district office level and below the data contain such wide variances that they

---

[83]See Estrada, page 19; Wolter pages 7-8; and Ericksen *et al.*, pages 20-21.

[84]Estrada, page 18.

[85]Recently, Mississippi's proposed redistricting plan was overturned by the Department of Justice for failure to use block-level data.

could not be reconciled without weighting them to much higher levels."[86] As an example he notes that "the [matching] effectiveness rates varied from a low of 87.2% in Albany to a high of 93.49% in Kansas City.... [T]here was a significantly different level of success in Kansas City than in Albany. But why? The answer is that we do not really know."[87]

Special Advisory Panel Member Tarrance links the usability of adjusted counts for redistricting with the disruption the use of such counts would cause.[88] These arguments will be considered under Guideline Seven.

Wachter has serious concerns about the usability of these adjusted counts. I consider his concerns about state population totals and reapportionment under Guideline Three.[89] He does, however, present evidence that casts serious doubt on homogeneity within post-strata. Because "very little is known about local heterogeneity in census coverage,"[90] he conducted simulations on 10 selected PES block clusters to determine the effect of an adjustment on both the improvement in the numeric level of the population at the district office level and the improvements in the shares

---

[86]McGehee, page 32.

[87]McGehee, page 4.

[88]See appendix 3: Tarrance, V. Lance "Report to the Secretary of Commerce," Member, Special Advisory Panel, June 14, 1991, [hereafter Tarrance], pages 17-18.

[89]Wachter, pages 24-26.

[90]Wachter, page 26.

or proportions of the population in a given district office. In other words, he considered both numeric and distributive accuracy. In Wachter's simulations, the level of the population is improved about twice as often as it is worsened by an adjustment. However, the shares suffer much more from the simulated adjustment. On average 59% of the office proportions are better, but the range over all the simulations shows anywhere between 39% to 78% improvements. Furthermore, in 7% of the simulation trials a majority of the districts are made worse. Now in any simulation, a true population for a block must also be simulated. Wachter argues that truth is chosen in his simulations so as to overestimate improvements achievable by an adjustment.

Wachter's evidence on heterogeneity is the only evidence that looks at actual behavior in the 1990 census and PES below the state level, and the only evidence that looks at the effect of heterogeneity on the shares of the population rather than the population levels. He states that his results are preliminary and need more work--but at least they are results that bear directly on the homogeneity issue. I find compelling his conclusion that "local heterogeneity is a serious problem for adjusting the 1990 census at district levels. My evidence indicates that a substantial portion, possibly a majority, of relative counts for district-size units can be made worse off by adjustment."[91]

Wachter made other efforts to measure block-to-block heterogeneity and district-to-district heterogeneity. These other attempts are inconclusive and neither support nor deny

---

[91]Wachter, page 29.

the homogeneity assumption, so, therefore, I did not consider them to weigh either for or against an adjustment.[92]

Heterogeneity and local variability pose a vexing problem for synthetic adjustment as GAO noted in their testimony.[93] In his article, Freedman makes this clear:

Variability is a major obstacle to adjustment. Indeed, undercount rates differ from one geographical area to another, and from one demographic group to another. That is why synthetic estimates for small areas, based on demographic analysis, have not been widely accepted. However, adjustment by the DSE [Dual System Estimate] is unsatisfactory for the same reason. For example, one post-stratum consists of Hispanics--cross-classified by age, sex, and housing tenure--in central cities in the Pacific Division (California, Washington, Oregon, Alaska, and Hawaii). In round numbers, the 1990 population of the Pacific Division is about 40 million with 8 million Hispanics, 5 million of the latter being in southern California.

Consider an adjustment for Stockton, a city of about 200,000 people in California's Central Valley, a 4-hour drive north of Los Angeles. The Hispanic population is about 50,000; there can be at most a few dozen Hispanics from Stockton in the PES [Post-enumeration survey], and a handful of gross omissions [persons counted in the "p" sample who were not in the "e" sample (census)] or erroneous enumerations [persons counted in the "e" sample

---

[92]Wachter, pages 30-32.

[93]See the quotation from GAO in Guideline One.

(census) who were not found in the "p" sample]. No stable estimates could be developed from a sample that small. Instead, estimates for Stockton would be based on the adjustment factor for the whole post-stratum, the numbers being driven by PES data from southern California. The basic assumption: undercount rates for Hispanics are the same in Stockton as in Los Angeles. *There is no empirical evidence to support this assumption.* [Emphasis added.] And there is a similar problem for non-Hispanics. Indeed, adjustment factors for non-Hispanics in Stockton are driven by PES data on non-Hispanics in the whole Pacific Division. Apparently, Stockton's non-Hispanics are supposed to be like their counterparts in the north, while its Hispanics are taken to be southern. *Stockton is the rule not the exception.* [Emphasis added.] There are 39,000 state and local government areas to adjust; and only 5,000 sample blocks with PES data. *Most jurisdictions would be adjusted on the basis of data from elsewhere* [Emphasis added.]--and the synthetic assumption.[94]

None of the evidence I was given, other than Wachter's, confronted the measurement of this problem head on. The questions that remain unanswered are fundamental: What is the extent of residual heterogeneity within post-strata down to the county, city, precinct and block level, and what is the effect of that heterogeneity on the adjusted estimates both in levels and shares? Until this is known, the statement that the counts are usable for all census purposes is no more than an assertion.

---

[94]Freedman, pages 1233-1236.

Conclusions

I conclude that the considerations pointed to by Guideline Two tend to reject use of the adjusted figures and support use of the census counts. The adjusted figures--like the census counts--are consistent across all jurisdictional levels and of sufficient detail for all purposes. However, the adjusted figures do not appear to be of sufficient quality to be usable for reapportionment and redistricting. First, the distributive accuracy of the census counts is superior as concluded above in my review of the evidence on Guideline One. Furthermore, substantial evidence casts doubt on the homogeneity assumption underlying the entire synthetic adjustment methodology. Even if the tests discussed under Guideline One and based on the homogeneity assumption had proven favorable to adjustment, this evidence would weigh against adjustment. Instead, both considerations imply that the adjusted figures are not of sufficient quality to be usable for reapportionment and legislative redistricting. Thus, this Guideline weighs in favor of a decision not to adjust the census.

Guideline Three

The 1990 census may be adjusted if the estimates generated from the pre-specified procedures that will lead to an adjustment decision are shown to be more accurate than the census enumeration. In particular, these estimates must be shown to be robust to variations in reasonable alternatives to the production procedures, and to variations in the statistical models used to generate the adjusted figures.

Explanation

The Bureau of the Census will determine the technical and operational procedures necessary for an adjustment decision before the results of the post-enumeration survey are known. This procedure shall be chosen to yield the most accurate adjusted counts that pre-census knowledge and judgment can provide. The Bureau of the Census will then assess the components of systematic and random error in the procedure and it will assess the robustness of the estimates generated from that procedure. Various procedures and statistical models can be used to generate estimates of net overcounts or net undercounts and adjustment factors. This guideline specifies that a set of procedures for generating proposed adjusted counts will be determined in advance of receiving the 1990 post-enumeration-survey estimates. This guideline requires that these procedures be evaluated. These evaluations will identify other procedures and models that could be considered as reasonable alternatives to the chosen production process. These alternatives will be used to assess the accuracy and precision of the proposed adjusted counts. In addition they will be used to assess whether and by how much the adjusted counts could vary if alternative procedures were used.

Discussion

There are three questions raised by this guideline that have not already been dealt with in my conclusions about accuracy in the discussion of Guideline One:

(1) Were the procedures followed pre-specified?

(2) Were the estimates robust to production alternatives?

(3) Were the estimates robust to alternative statistical models?

Prespecification

The question of prespecification is difficult. No production of the complexity of the census or the PES can be completely prespecified. There are always unforeseen events that occur and that require modifications to the plan. In fact the procedures for the PES and for generating an adjusted count of the population were, broadly speaking, as prespecified. Even though there were several decisions, of some importance, made in the course of the estimation procedure, all were made solely by the career professional staff at the Census Bureau. The decisions reflected the best professional judgment of those career public officials vested with the responsibility for the census and the PES.

First, a decision was made not to combine DA with the PES to generate dual-system estimates. Second, there was a choice made of carrier variables to be used in the smoothing process. These variables help determine how the raw adjustment factors (published on April 18, 1991) are converted to the smoothed adjustment factors (published on June 13, 1991). Finally, in the smoothing process itself some observations which were either peculiar in their magnitude or their variance were treated specially. The Special Advisory Panel members were consulted in trying to deal with the difficulties encountered in the smoothing process.

Kruskal, Tarrance, and McGehee all raise concerns about the prespecification question. It is Kruskal's impression "that choice of the so-called smoothing procedures was profoundly based on PES results. One might indeed argue that such a choice has major merits, but it does not seem to me to follow the Guideline"[95] McGehee argues more strongly: "One's confidence is further eroded when--in an effort to explain unexpected results--the Bureau resorts to novel explanations, re-manipulation of the data, and a variety of other *ad hoc* techniques."[96] Tarrance expresses similar concerns: "Some procedures have been pre-specified but, as in all statistical operations, others have been suggested and/or adopted as the operations have been carried out. I have been concerned to note that a number of changes have been made in the last 18 months."[97] He also notes that "any attitude of 'if the numbers don't come out the way we think they should we can changes plans' is diametrically opposed to what good government policy should allow. Furthermore, it is clear that the adjustment process is a statistical operation which has never been done before and there are many last-minute decisions being made."[98]

Ericksen, Estrada, and Tukey either find no problem with the prespecified procedures or do not mention it. Wolter notes that there were procedures in the enumeration that were changed late in the enumeration process that affected the PES; however, PES managers were able to

---

[95]Kruskal, page 4.

[96]McGehee, page 4.

[97]Tarrance, page 20.

[98]Tarrance, page 21.

cope with the changes in procedures. He also notes the decision not to combine the PES and DA and the smoothing decisions made during the PES process. He finds that each was treated with a high degree of professionalism.[99]

In any estimation process unforeseen difficulties will arise and no estimating system can be put on automatic pilot. The unsettling problem is that, as we will see below, the choices that occurred did make a difference in the outcome of the adjustment--differences large enough to change the implied apportionment of the Congress--and that different choices producing different results may have been made by other responsible individuals in the exercise of their best judgment. The enumeration process itself cannot be influenced in such a way. Any individual decision either has a tiny impact or is so distant from the final result (both in temporal terms and in statistical terms) that the decision maker does not know the import of his decision. This is simply not true of the types of decisions made here in the course of calculating PES count estimates. State counts were easily available to the persons deciding which smoothing method would be used. Although I believe that the decisions were made for sound professional reasons in the 1990 census, using these adjustment mechanisms opens the possibility for manipulation of future post enumeration surveys in ways that are unavailable in traditional census procedures. This weighs heavily against an adjustment of the census.

---

[99]Wolter, page 9-10.

Robustness of the Results

I will combine the discussions of the robustness to alternative statistical methods and production methods in this section because they are for the most part intertwined.

One area in which statistical models could have an impact on the result of the PES is in the imputation of match status. As individuals from the PES are matched back to the census some cannot be definitively declared matched or unmatched, often due to missing data. The missing data were imputed to the unresolved cases and a match status was then assigned using a series of statistical models. The levels of missing data were sufficiently low that variation in these models made essentially no difference in the outcome of the PES (Studies P1 and P2). Here I concur with the Undercount Steering Committee judgment that the outcome is robust to the alternatives considered, although, as noted above, Wachter warns that unexamined assumptions underlie the statistical imputation models and, in fact, the results could be sensitive to these assumptions.[100]

Wachter notes that the sensitivity of the imputation results to these unexamined assumptions, however, could have an impact on the apportionment of the House of Representatives that would be implied by an adjustment. He considers five alternative adjustment calculations: the smoothed estimates, the raw estimates, two of his imputation alternatives, and a fifth estimate that uses state adjustment factors based only on PES data gathered within that state. He finds that each method implies a different apportionment of the House, and eleven states either gain or lose a seat in

---

[100]Wachter, pages 21-22.

at least one of the five alternatives. This instability in the results of the adjustment for the Constitutional purpose of the census argues strongly against an adjustment.[101]

The second area in which different methods could have affected the outcome is in poststratification. All the members of the same post-stratum receive the same adjustment factor. If post-strata are chosen differently then outcomes may be different. The Census Bureau investigated whether changes in the post-stratification by census division would change the results significantly by using an alternative post-stratification by state. This showed that three states would have had significantly different counts. It is also important to note that any variation due to uncertainty in post-stratification is not incorporated in the total error model.

A third area of concern is that of smoothing procedures. Smoothing is a technique that is used to remove some of the effects of random variability in the estimates of the adjustment factors for the 1392 post-strata, while

---

[101]In connection with the loss function studies discussed in Guideline One, the Census Bureau compared the apportionment implied by the census to that implied by the so-called target population. They differed by two seats. The Bureau then considered 1000 random draws from the production DSE statistical distribution and compared the apportionment that would result from each draw to the target population apportionment. For 391 of the draws the production DSE apportionment did not differ from the target apportionment. For 567 of the draws there was a difference of one seat. For 42 there was a difference of two seats. This only shows that the PES estimator of apportionment differed from the target apportionment by 0.65 seats on average. It says nothing about the quality of the census, since the target is simply another adjusted estimate of the population, as the discussion of Guideline One demonstrates.

preserving the meaningful systematic differences between subgroups. Since these adjustment factors are the results of a statistical process, they are subject to random variation. If you had taken a second sample the answer would be different. But some variation across the different poststrata is a result of real differences in behavior not simply random statistical variation. The point of the smoothing exercise is to remove the *random* variation while attempting to retain the real differences.

Smoothing involves three major judgmental decisions--the treatment of outliers, the variance pre-smoothing, and the choice of so-called carrier variables. We consider first the treatment of outliers. This is an extremely complex problem that posed great unforeseen difficulty for the Census Bureau. Let me start with a simple observation. When the final PES numbers were announced on June 13, 1991, a modified set of PES numbers was included as one of the alternatives considered as a possible set of final PES numbers but not selected. This set of numbers stood apart from the census and was closer to the selected method than the census. Thus it was a candidate for selection. This alternative, had it been chosen, would have implied a different apportionment of the Congress than the selected method. If the selected method were chosen and if the Congress were reapportioned on the basis of those numbers, California and Arizona would gain one more seat each and Pennsylvania and Wisconsin each would lose one seat compared to the census. Use of the modified PES estimates instead of the selected method would have resulted in a shift of only one seat--from Wisconsin to California. It is important to note that the only difference between the two methods is that, in the selected PES. 28 outlying variances out of 1392 variances were omitted from variance

smoothing. In the modified version these 28 points were not omitted. Thus changing the treatment of only 2% of the points could have changed the allocation of one seat in the House of Representatives. I have included in Appendix 10 a list of State, county, and city populations under three smoothing schemes: the selected method, the modified method, and the raw adjustment without smoothing. Some of the sensitivities to smoothing choice are evident from these charts themselves. Let me highlight a few:

• The undercount rate for Arizona is estimated to be 2.8% under the modified PES smoothing scheme and 3.3% under the selected PES smoothing scheme.

• The undercount rate for Maryland is estimated to be 2.5% under the modified PES smoothing scheme and 1.8% under the selected PES smoothing scheme.[102]

• The undercount rate for the District of Columbia is estimated to be 5.6% under the modified PES and 5.0% under the selected PES smoothing scheme

• The undercount rate for Akron, Ohio, is estimated to be 2.2% under the modified smoothing scheme and 3.0% under the selected PES smoothing scheme.

• The undercount rate for Pasadena, Texas, is estimated to be 3.7% under the modified smoothing scheme and 3.0% under the selected PES smoothing scheme.

---

[102]If a state is estimated to have a greater than average (*i.e.*, 2.1%) undercount it gains proportionally from an adjustment. States below 2.1% lose. Thus the choice of adjustment method, had adjustment been used, would have determined whether Maryland was a winner or loser.

• The undercount rate for Miami, Florida, is estimated to be 5.4% under the modified smoothing scheme and 4.6% under the selected PES smoothing scheme.

The Census Bureau analysis emphasizes that the set of various population estimates derived from different smoothing methods are broadly similar in the counts they produce and, as a group, distinct from the census enumeration. I believe that, in fact, it would be difficult to choose on any objective statistical grounds among the host of alternatives the Census Bureau considered which do in fact produce different results for the Constitutional purposes of the census. As noted in the discussion of Guideline One, accuracy must be considered in terms of the distribution of the population not numeric accuracy. The Census Bureau analysis does not consider the similarity in terms of the population distribution of the sets of estimates or whether the variance inherent in those estimates, warrants the discarding of the census in favor of one of the particular estimates.

Wachter's analysis of the smoothing procedures that the Census Bureau used in developing the adjustment estimates also raises some serious concerns. He believes that "smoothing has turned out to be the most problematic part of the adjustment calculations," and that "the evidence leads me to fear that the smoothing has had more of an effect on the final adjustment than can be easily justified."[103]

As noted above, smoothing is a technique that is used to remove some of the effects of random variability in the estimates of the adjustment factors for the 1392 post-strata, while attempting to preserve the meaningful systematic

---

[103]Wachter, page 33 and page 34.

differences. This is done using a technique called linear regression that "holds constant" attributes of the population we expect to be associated with low or high undercount rates in an attempt to isolate the random variation. The choice of the attributes to be "held constant"--also called carrier variables--is a matter of concern and will be discussed below. These regressions yield estimates of adjustment factors that supposedly have been purged of their random variability. Wachter characterizes these estimates as being "flattened."[104]

To calculate the smoothed factors one takes an average of the raw adjustment factor (before flattening) and the flattened adjustment factor--but a weighted, not a simple, average is used. For a particular post-strata, if you have observed a lot of random variability, the smoothed factor is chosen to be closer to the flattened factor--that is, the weight on the flattened factor is high and the weight on the raw factor is low. On the other hand, if the raw adjustment factor is fairly stable and does not show much random variation, you put more weight on the raw factor and less on the flattened factor when you calculate the smoothed factor. The smaller the random variation in a poststratum, the more the smoothed factor relies on the observed data and the less it relies on the regression estimate.

But there is another level of complication. The measures of random variation, called variances, are themselves subject to random variation and, as happened in this PES, the variances can be large and unruly. The variances themselves vary a lot. When there are large measured variances, the smoothed factors are closer to the

---

[104]Wachter, page 35.

flattened estimates and on the whole, you tend to get lower adjustment estimates. The Census Bureau decided to soften this effect by pre-smoothing the variances before smoothing the adjustment factors. So there are two levels of smoothing--first variances, then factors.

Wachter shows that "the effect of deciding to use pre-smoothed rather than unsmoothed variances is to raise many of the adjustment factors by several percentage points and raise some by more than six percentage points. The changes introduced into the adjustment factors are of the same order of magnitude as the sizes of the adjustment factors themselves. These are huge changes for a decision of detail."[105] The fact that the statistical artifice of variance smoothing is making substantial differences in adjustment factors is disturbing. As Wachter observes:

The raw adjustment factors are at only one remove from the data, the PES fieldwork that is the real information we have. Assumptions go into their computation and they are subject to many kinds of random and systematic errors. Notwithstanding these limitations, there is a fairly direct link between people missed or miscounted somewhere in a sample block and a big or small raw adjustment factor. Smoothing the factors themselves involves operating at two removes from the data, importing more assumptions, but incorporating information about variability that comes ultimately out of fieldwork. Pre-smoothing the variances that go into smoothing the adjustment factors is at three removes from the data. It incorporates little, if any, further

---

[105]Wachter, page 36.

empirical information. It depends entirely on another set of assumptions.[106]

The fact that pre-smoothing makes so much difference reflects the irregular and variable nature of the PES data. The implication is that the assumptions underlying the statistical models being used are important determinants of the outcome of the adjustment calculation.

Wachter discusses at length the reasons for variance pre-smoothing, but one argument he made was particularly striking. The variance pre-smoothing essentially results in large variances being made smaller and small variances being enlarged slightly. This seems to be the opposite of what is desired. A large variance means that the adjustment factor is not well estimated--it is noisy--so when smoothing the factor you should put *more* weight on the so-called flattened factor. Decreasing the large variance means you put *less* weight on the so-called flattened factor. The opposite argument can be made for small variances. Therefore, variance pre-smoothing is arguably having a result exactly opposite from that intended by the smoothing process. In addition, because low adjustment factors tend to have small variances, pre-smoothing makes those variances higher and thus systematically discounts the evidence of low net undercounts.[107] In other words, presmoothing tends to

---

[106]Wachter, page 37.

[107]Wachter, page 39.

artificially inflate already high undercount rates and artificially dampen already low undercount rates.[108]

Wachter cites three other problems with variance pre-smoothing: First, the variance smoothing is not directed at making covariances more accurate. In his view the motivation for presmoothing was heuristic. Second, there are no strong reasons for choosing among the many models available to actually smooth the variances. Third, the choice about variance pre-smoothing affects not only the adjustment factors but the total net adjustments for broad aggregates of the population. For example, the variance presmoothing changes the estimated net undercount in the West South Central region from 2.95% to 2.76%. In the East South

---

[108]In their letter submitted on July 11, 1991, Ericksen and Tukey dispute Wachter's concerns over variance pre-smoothing and contend that variance pre-smoothing helped the accuracy of the adjustment. In his rebuttal letter, submitted on July 12, 1991, Wachter stands by his statements. Both letters are contained in Appendix 16. It is difficult to referee this dispute in the eleventh hour, especially since the lateness of the Ericksen/Tukey letter gave little chance for Wachter to prepare a detailed response. In checking with the Census Bureau, I have found that, in fact, the pre-smoothing operation was agreed upon in advance, but in mid-May difficulties were encountered in that operation. The Census Bureau consulted with the panel and Tukey offered several remedies that Hoaglin and Glickman refer to as "prescriptions in the spirit of a mustard plaster . . . not a tightly specified procedure derived from established statistical theory." (Appendix E of Ericksen, *et al.*, page 15.) Although Hoaglin and Glickman, seem to indicate that the choice among the three remedies should not have much effect on the ultimate smoothed estimates, one of the three shows exactly the phenomenon that concerns Wachter, of raising high variances and lowering small ones. (See Appendix E of Ericksen *et al.*, page 22.) In fact, the choice of the "mustard plaster" did have an effect on apportionment (see main text above). Finally as Wachter points out, there is disagreement as to what constitutes a reasonable alternative.

Central, it changes from 2.43% to 2.68%.[109] Again, these are changes of a very significant magnitude given the size of the national net undercount.

The choice of carrier variables in the statistical regression procedures used to smooth the adjustment factors could have a significant impact on the outcome. The Special Advisory Panel commissioned a study by David Hoaglin to study this impact. This study is used extensively in the arguments of Ericksen, Estrada, Tukey, and Wolter. The conclusion was much the same as with the various treatment of outliers. The carrier variable choice made a difference, although in absolute numeric terms not a huge difference. The 13 models Hoaglin produces look roughly similar to each other and to the production PES estimates all of which are distinct from the census. The same is true if relative shares for the thirteen evaluation post-strata are computed--the various carrier variables produce results closer to the production PES estimates than to the census. No results are available at finer geographic levels (such as states, counties, or cities.) Wachter's assessment of the carrier variable selection is that "the effects of variable selection are not negligible but they are not a central issue."[110]

Ericksen points out that the total error model shows that the effects of the PES biases on population shares for the 13 large evaluation post-strata are small. In addition, he contends that his examination of the two estimates in the June 13, 1991, press release, shows the state population shares to be stable for the states that would gain or lose seats

---

[109]Wachter, page 39 and Table 3.1.

[110]Wachter, page 41.

if the House of Representatives were reapportioned on the basis of adjusted counts. His reasoning is that the adjustments are larger than one or two times the standard error.[111] The difficulty with his reasoning is that it only considers sampling variability and ignores whether the shares are robust with respect to alternative statistical and production methods.

Conclusions

I have previously concluded that the adjusted figures have not been shown to be more accurate than the census enumeration. That is all that is required under Guideline Three to conclude that the census may not be adjusted. There are, however, additional considerations under Guideline Three under which I also conclude the 1990 census should not be adjusted.

It has proved virtually an impossible task to prespecify the adjustment procedure. It is equally impossible to prespecify the Census procedure. However, in the adjustment procedure an individual or responsible group must make choices which have politically significant effects on the counts that can be transparent to those making the choices. This puts the counts at greater risk of being manipulated than the census. There is no evidence of unprofessional or political manipulation in the 1990 PES program.

The results of the adjustment procedure are broadly robust at an aggregate, national level. However, although various alternatives seem to distribute counts in roughly

---

[111]Ericksen, page 3.

similar ways, small changes in methodology can move seats in the House. It is also true that small changes in the census enumeration can move seats in the House as well, but no individual involved in the enumeration process can predict how. That is not true for the decisions for adjustment that cannot be or were not prespecified.

One of the most problematic parts of the adjusted process was the bundle of statistical techniques contained in the smoothing process. These techniques relied heavily on statistical assumptions, resulted in large changes in adjustment factors, and may very well have led to an overstatement of the undercount. Thus, this guideline weighs in favor of a decision not to adjust.

Guideline Four

The decision whether or not to adjust the 1990 census should take into account the effects such a decision might have on future census efforts.

Explanation

The Decennial Census is an integral part of our democratic process. Participation in the census must be encouraged. Respect for the objectivity, accuracy, and confidentiality of the census process must be maintained. Accordingly, if evidence suggests that adjustment would erode public confidence in the census or call into question the necessity of the population participating in future censuses, then that would weigh against adjustment.

On the other hand, if evidence suggests that the failure to adjust would erode public confidence in the census

and thus result in widespread disinclination to participate in future censuses, that would argue for adjustment. The extent to which a non-adjustment would be perceived as a politically motivated act, and thus would undermine the integrity of the census, should also be weighed in making any adjustment decision.

Discussion

There is no scientific or quantitative means by which we can determine with reasonable certainty the impact of a decision made in 1991 on human behavior and activities that will occur in the year 2000 and beyond. Indeed, this guideline merely requires that we consider the effects that our decision today might have on future census efforts. In my view, such consideration requires that we examine relevant information and draw upon past Census Bureau experience as well as common sense in making rational predictions about such effects.

The universe of "future census efforts" encompasses a wide variety of activities: the efforts of individuals in completing census forms and cooperating with enumerators; the efforts of state and local officials, civic leaders and special interest groups in supporting outreach programs, public awareness campaigns, and active involvement in counting their target populations; the efforts of Census Bureau workers in enumerating as many households as possible; the efforts of Census Bureau professionals in making judgments and decisions about procedures to achieve the most accurate counts possible and to ensure objectivity and integrity of the process; and the efforts of the Department of Commerce, which includes the Census Bureau, to ensure appropriate levels of funding from

Congress to support its enumeration activities. Each of these activities affects participation in and coverage of the census. To the extent that we can draw on relevant data, observations, and experience, consideration of the effects of decisions to adjust or not adjust on each of these activities is appropriate.

Sources relevant to our considerations include a study by the National Opinion Research Council (NORC),[112] public comments on the adjustment decision,[113] comments on Guideline Four submitted by the members of the Special Advisory Panel,[114] and discussions with experienced Census Bureau officials. Based on these sources, it is my conclusion that there is greater risk of potential harm to future census efforts as a result of a decision to adjust than as a result of a decision not to adjust. A discussion of the possible effects on each of these activities follows.

Effects on Individual Participation

Recently, the Census Bureau commissioned a study by the National Opinion Research Corporation (NORC) to try to measure how an adjustment might affect future census behavior by means of a telephone survey of a representative national sample of 2,478 households.

---

[112]See Appendix 11. National Opinion Research Corporation, The Potential Impact of Adjusting of Not Adjusting the 1990 Census, June 19, 1991.

[113]See summary of comments on Guideline Four in Appendix 8.

[114]Ericksen, page 3; Estrada, page 20; Kruskal page 4; McGehee, page 33; Tarrance page 23; Tukey, page 2; and Wachter, page 42.

Persons were asked to evaluate the likelihood that they would participate in the next census. Then they were asked how that likelihood would change if there were an adjustment and how that likelihood would change if there were not an adjustment. The results were paradoxical--both a decision to adjust and a decision not to adjust would decrease the likelihood of participation.

The survey shows that the adjustment issue is not high in public consciousness or well understood. Only one-quarter (23.4 percent) of persons said they had seen or heard anything about the census in the past few months. When probed about what they had seen or heard, only 14.1 percent spontaneously mentioned anything to do with adjustment, undercount or errors in the census count. When told that people are talking about whether or not to adjust the results of the census to correct for errors in counting the population, 22.3 percent then recalled they had seen or heard something about this. Probing questions showed that only 4.9 percent understand the adjustment issue.

Prior to any discussion of adjustment, a total of 84 percent of those surveyed stated they were "extremely or very likely to participate" in the next census. After the discussion of adjustment, 75.5% were "extremely or very likely to participate" in the future if the census were adjusted, as compared to 71.3% if it were not. Thus, while these results indicate that intention to participate in future censuses is marginally higher if the census were adjusted than if it were not, there is less inclination to participate in the future regardless of the outcome of the decision. As NORC points out in its conclusions: "While large numbers remain very favorably disposed to participating in the next and future censuses, this intention is a very slippery,

ephemeral and changeable one . . . subject to influence by factors like the adjustment decision or, more likely, from the controversy or fallout emanating from the events that follow that decision." The survey also indicates that, prior to any discussion of adjustment, 5.5 percent were "not very likely" to participate in the next census. A decision to adjust would result in 5.3 percent in the "not very likely" category. A decision not to adjust would result in 8.6 percent in this category.

It is unclear what this survey meaningfully demonstrates, other than confusion over what an adjustment is and the negative effect of the controversy over adjustment on the present perception of a person's likelihood of participation in future censuses. However, as the survey report emphasizes, the need to explain the issue of adjustment and its implications will necessarily outlive the survey and the adjustment decision itself, and the inability of the surveyors to explain the issues to those surveyed is certainly grounds for some caution.

The division of public opinion on the future effects of adjustment indicated by this survey is consistent with the division of opinion demonstrated by the public comments received by the Department. While some claimed that an adjustment would erode public confidence in the census and thus lower future participation, others claimed that a decision not to adjust would erode public confidence and thus lower future participation.

The explanation of this Guideline states that evidence of widespread disinclination to participate in future censuses as a result of a decision not to adjust would weigh in favor of an adjustment. Neither the public comments nor the

NORC survey provide evidence that this will occur. Indeed, the NORC study indicates that a decision not to adjust would make only 8.6 percent "not very likely" to participate in the future, just 3.1 percent more than those who would be "not very likely" to participate in any event. Thus, while there would be some additional disinclination to participate, it would not be widespread.

The explanation of this Guideline also states that evidence that calls into question the necessity of the population participating in future censuses would weigh against an adjustment. A number of the public comments express concern that an adjustment would result in the perception that an individual's failure to participate would be compensated by an adjustment and thus lower participation. In light of this, I am skeptical rather than optimistic about the likely motivation of individuals to participate in the future if an adjustment were made. However, I do not find compelling evidence in either direction regarding the effects of a decision on future individual motivations.

Effects on Complete Count Efforts by State, Local, Civic, and Interest Group Leaders

A number of the public commentators, as well as Wachter[115] and Tarrance,[116] expressed serious concerns that an adjustment would negatively affect the efforts by state, community, civic, and interest group leaders who traditionally provide essential support in encouraging participation in the census. I share these concerns.

---

[115]Wachter, page 42.

[116]Tarrance, page 23.

Currently, it is in the interests of every governor, mayor, and interest group to help get their target populations counted. The Census Bureau works closely with such officials and groups for two to three years before census day. The efforts include mapping, address compilation, massive advertising campaigns, and public awareness activities. I agree with my advisors who believe that such cooperative efforts are absolutely critical to the Census Bureau's mission to conduct an actual enumeration of all persons residing in the United States on census day, and particularly critical in reaching the hardest to count. Like others, I am concerned that an adjustment will remove the incentive that these public officials and groups currently have to provide active support in achieving a complete count.

Based on the public comments, it is clear that many public officials believe that an adjustment will correct specific errors they have identified in the count of their communities. With such mistaken impressions, it is unrealistic to expect these leaders to put census outreach efforts above the many other claims on their limited resources. As Wachter predicts, complete count committees, local advertising, celebrity appearances, and special programs to ensure more complete minority counts would be likely to suffer as a result of an adjustment.[117]

Senior officials at the Bureau, including the Director, agree with this assessment. At the same time, the Director believes that states and cities will still have an incentive to encourage participation in order to get the best possible city planning data. I find this unpersuasive in light of the numerous public comments received from local officials

---

[117]Wachter, page 42.

demonstrating a profound lack of understanding of the effects of an adjustment and a misplaced faith in its ability to correct particular problems they have identified in their communities.

I find no evidence indicating that local support would decrease as a result of a decision not to adjust the census.

Effects on Funding of Future Censuses

Tarrance[118] and Wachter[119] expressed concern that an adjustment would adversely affect the Department's ability to obtain sufficient funding for future censuses. I share this concern. The most expensive element of the census is the extraordinary effort to count the last five percent. With the illusory prospect of an adjustment to achieve a full count in congressional districts and states, it would simply be unrealistic to expect Congress to appropriate funds to the full extent necessary to complete an enumeration of the hard to count. Without the funds needed to complete an enumeration, the quality of census data, especially in smaller areas, would be jeopardized. There appears to be little risk that Congress would deny such funds as a result of a decision not to adjust.

Effects on Efforts by Census Enumerators

As Wachter recognized, the future effects of a decision to adjust could be most severe on those temporary

---

[118]Tarrance, page 23.

[119]Wachter, pages 42-43.

workers who must actually conduct the enumeration process.[120] The difficulties of hiring, training, and supervising the thousands of temporary census employees are well-known and well-documented. It is time-consuming, often tedious, and occasionally dangerous work that requires extraordinary diligence for less than commensurate pay. There is a real risk that, with an expectation of a correction through adjustment, the field staff would not have the same sense of commitment and public mission in future censuses and, as a result, careless and incomplete work would increase, thereby decreasing the quality of census data. These are the workers the Bureau depends on to collect the data from the groups that are hardest to enumerate. If these data suffer, the information lost at the margin is information that is especially important to policy development.

I am unaware of any concerns that census enumerators would be less motivated as a result of a decision not to adjust the census.

Effects on the Independence of Bureau Professionals and the Integrity of the Census

Senior Bureau officials as well as Tarrance[121], Wachter[122], and McGehee[123] have raised concerns about the potential for manipulation of an adjustment for partisan purposes. As Wachter recognized, adjustment may pose

---

[120]Wachter, page 43.

[121]Tarrance, page 5.

[122]Wachter, page 44.

[123]McGehee, page 33.

significant risk to the technical independence of Census Bureau professionals who have traditionally been free from external influence in the implementation of their mission.[124] A principal drawback of adjustment is the fact that a few technical decisions can swing the outcomes of apportionment, redistricting, and Federal funding allocation. Decisions that may be nearly equally defensible from a technical standpoint may have very different outcomes which can be known in advance of the decisions. Thus, adjustment opens the door to manipulation of the census for partisan gain. It would therefore greatly increase not only external scrutiny and second-guessing of Census Bureau professionals and prospective candidates for key technical positions, but also inevitably increase pressure to politicize these positions. This would impose an even greater burden on technical staff in their attempts to make scrupulously objective and fair decisions. These risks pose serious threats to the integrity and objectivity of future censuses.

Concerns have also been expressed in the public comments and by Wolter[125] that a decision not to adjust the census may be seen as politically motivated and therefore adversely affect the integrity of the census. While I recognize these concerns, I believe they are outweighed by the likely adverse effects on future census efforts from an adjustment.

Conclusion

---

[124]Wachter, page 44.

[125]Wolter, page 11.

Based on the information available, I conclude that an adjustment would adversely affect future census efforts to a greater extent than any adverse effects of a decision not to adjust. The evidence indicates that the controversy over adjustment is likely to have a negative effect on future censuses regardless of the outcome of the adjustment decision. I am concerned that an adjustment would reduce state and local support for future censuses, adversely affect the Department's ability to obtain appropriate funding for future censuses, adversely affect the quality of the work done in the future by temporary census enumerators who are essential in reaching the hard-to-count, subject the Census Bureau to partisan pressures, and create the possibility for political manipulation of future census counts. Thus, this guideline weighs in favor of a decision not to adjust.

Guideline Five

Any adjustment of the 1990 Census may not violate the United States Constitution or Federal statutes.

If an adjustment would violate Article I, Section 2, Clause 3 of the U.S. Constitution, as amended by Amendment 14, section 2, or 13 U.S.C. section 195, or any other constitutional provision, statute or later enacted legislation, it cannot be carried out.

Discussion

In addition to the technical and operational aspects of the census and the proposed adjustment which I have considered in connection with Guidelines One through Four, I have also considered the constitutional and statutory implications of an adjustment decision. In my view, neither

the Constitution nor the relevant statutory provisions are themselves conclusive as to whether the proposed adjustment would be unconstitutional or unlawful because the *sine qua nons* of constitutionality and lawfulness and the propriety of adjustment are the same: the need for unambiguous accuracy of the adjustment methodology and data. Because analysis of the significant legal issues is thus dependent upon the statistical analysis, which itself mandated my decision on the substantive merits not to adjust, it was unnecessary to decide the legal issues. This Guideline therefore only served to verify, not determine, my decision.

Constitutional Considerations

While not free from doubt, it appears that the Constitution might permit a statistical adjustment, but only if it would assure an accurate population count. See *Carey v. Klutznick*, 508 F.Supp. 404 (S.D.N.Y.1980); *Young v. Klutznick*, 497 F.Supp. 1318 (E.D. MI 1980). By implication, then, a determination that the proposed adjustment would not discernably or reliably improve the accuracy of the headcount would raise uncompromisable constitutional concerns, inasmuch as adjustment would not be contributing to the most accurate count, but rather would be injecting additional uncertainty and error. Thus, while the Constitution might not, *per se*, bar an adjustment, the question of whether a particular adjustment is constitutionally valid can only be made after the final form of the adjustment is known.

This principle--that an adjustment must be consistent with the constitutional requirement of "enumeration," i.e., an accurate count free from politicization and equivocation--is also supported by the intent of the Framers that the census

utilize verifiable methods which obtain an accurate population count. This goal of accuracy would not be met, to give the clearest example, by mere guesswork. The central question under the Constitution thus supports, though it did not determine, my conclusion; the need for verifiable methodology and unambiguous data are the modern-day requisites of what was explicitly desired by the Framers when they provided for an "actual Enumeration." That phrase commands for all time that what shaped the details of the very first congressional apportionment (there was then as yet no census)--guesswork and political deal-making--never would be permitted again.

As the discussion of Guideline One demonstrates, the evidence of improved accuracy resulting from the proffered adjustment methodology is at best mixed. That evidence is not sufficient as a matter of substantive merit and, derivatively, it also fails the test prescribed under the Constitution. While the essence of my decision not to adjust rests in the uncertainty of the proposed adjustment and the questionable nature of the data produced, that very uncertainty and question mark the rough shoals of politicization that the framers mandated be avoided when they required "enumeration," that is, an objectively accurate count.

Census Act Provisions

The Census Act contains two provisions authorizing the Secretary of Commerce to use sampling to conduct the decennial census. See 13 U.S.C. section 141(a) and 13 U.S.C. section 195.

Section 141(a) provides in pertinent part:

The Secretary shall, in the year 1980 and every 10 years thereafter, take a decennial census of population as of the first day of April of such year, which date shall be known as the "decennial census date", in such form and content as he may determine, *including the use of sampling procedures and special surveys.* (Emphasis added.)

Section 195 provides:

Except for the determination of population for purposes of apportionment of Representatives in Congress among the several States, the Secretary shall, if he considers it feasible, authorize the use of the statistical method known as "sampling" in carrying out the provisions of this title (Emphasis added.)

While judicial opinion is unsettled on the question of whether adjustment violates section 195, the majority of courts considering this issue have ruled that section 195 permits an adjustment if the adjustment method makes the census more accurate. See *Cuomo v. Baldrige*, 674 F.Supp. 1089 (S.D.N.Y. 1980), *Carey v. Klutznick*, 508 F.Supp. 404, at 415 (S.D.N.Y. 1980); see also, *City of Philadelphia v. Klutznick* 503 F.Supp. 663 at 679 (E.D. PA 1980); *City of New York et al. v. United States Department of Commerce. et al.*, (S.D.N.Y. 1990). *But see Orr, et al. v. Baldrige, et al.*, U.S.D.C., S.D. Ind., No. IP 81-604-C, July 1, 1985. Even assuming that the statute does not *per se* prohibit an adjustment, not all forms of adjustment would be sanctioned and the legality of the adjustment could only be determined after the form of adjustment is chosen. Thus, as with the constitutional issues, the analysis of the statutory issues cannot be separated from the analysis of the accuracy of the chosen adjustment method. Because the evidence of

improved accuracy from an adjustment is insufficient, the standard articulated by the majority of these courts is not met. While this legal conclusion was not dispositive, it affirms my decision not to adjust based on the substantive merits.

Conclusion

The question whether the chosen method of adjustment would violate the Constitution and federal statutes depends upon the substantive analysis of whether accuracy of the census is improved by an adjustment. Because there are other compelling substantive reasons not to adjust, legal considerations did not provide a basis for my decision.

Guideline Six

There will be a determination whether to adjust the 1990 census when sufficient data are available, and when analysis of the data is complete enough to make such a determination. If sufficient data and analysis of the data are not available in time to publish adjusted counts by July 15, 1991, a determination will be made not to adjust the 1990 census.

Explanation

It is inappropriate to decide to adjust without sufficient data and analysis. The Bureau will make every effort to ensure that such data are available and that their analysis is complete in time for the Secretary to decide to adjust and to publish adjusted data at the earliest practicable date and, in all events, not later than July 15, 1991, as agreed to in the stipulation. Note, however, that the

Department and the Bureau have consistently stated that this is the earliest possible date by which there is a 50 percent chance that an analysis could be completed on which a decision to adjust could be based. If, however, sufficient data and analysis of the data are not available in time, a determination will be made not to adjust the 1990 Census. The coverage evaluation research program will continue until all technical operations and evaluation studies are completed. Any decisions whether to adjust other data series will be made after completion of those operations.

Discussion

In order to evaluate the quality of the census and the post-enumeration survey, the Census Bureau conducted an extensive and ambitious research program designed to provide timely information on which to base a decision by July 15, 1991. Due in part to some unexpected anomalies in the data, progress on the evaluation was delayed in the final critical weeks, leaving the Bureau little time to complete its analyses. These pressures may have affected the quality of the research, and there is still much that we do not know about the quality of the PES and the adjusted counts relative to the enumeration. Nonetheless, based on the record available, I believe there is sufficient evidence to make a decision on adjustment.

The Census Bureau has done a remarkable job of condensing into a few short months a challenging evaluation program that was comparable to a multi-year research program for the 1980 census and the 1987 test of adjustment-related operations. The Census Bureau produced highly technical research on a very tight production schedule, using tools that were on the cutting edge of

statistical theory and survey methods. The dedication, professionalism and hard work of Census Bureau staff under often intense pressure is truly commendable.

Although sufficient data are available for me to decide the adjustment question, it is important to note that because of the court imposed deadline for the decision, the analyses of the data are far from compete. All parties involved in the decision making process have expressed a desire for more time to digest and analyze the voluminous material created by the research program. I am particularly concerned about problems in data quality and analysis that were revealed, or occurred, in the final weeks before the decision.

Good research requires a careful weighing of the evidence, especially when it is on the frontier of the science. When such novel research is to be used for such far-reaching policy purposes, it requires discussion with peers who have not been intimately involved with the details so that some perspective can be gained. It benefits from probing questions, from looking at the data from different perspectives, from the use of alternative models and from intense and independent professional scrutiny. The time schedule simply did not permit a full range of such activities.[126]

Before the release of the selected and modified PES numbers, an inconsistency was found in the calculation of the margins of error upon reviewing the proposed release in its penultimate form. This was not a subtle error, but one

---

[126]Kruskal makes a similar point (Kruskal, page 6) as does Tarrance (Tarrance, page 27).

that should have been caught by a careful cross-checking of the tables. After being informed of the inconsistency, the Census Bureau began work to discover its source. Fortunately, no fundamental error had been made. However, the release was delayed by almost two weeks, setting back an already tight schedule in the last critical weeks of evaluation. Such errors were the result of too much work being compressed into too little time. To its credit the Census Bureau worked hard to find the error, fix it, and ensure that accurate data were released.

Later, in reviewing the work of the Undercount Steering Committee, fundamental questions were raised about measurement of the relative accuracy of the census and the PES. The loss function analysis was found to be unconvincing. The Census Bureau was therefore asked to revisit parts of its work. As a result of these questions, the Bureau staff found an error in the calculation of the loss functions. Correction of this error changed the number of States for which the census counts were judged more accurate than the adjusted figures from 11 to 21--a substantial and significant increase.[127]

An Addendum to the Undercount Steering Committee report was filed on Thursday, June 27, 1991. In section 4 of that addendum, which is included as appendix 5, the Undercount Steering Committee states the following:

---

[127]As noted in Guideline One, these numbers are for the version of the analysis in which it is assumed that the measured variance is the whole story. As discussed there, the change is even more dramatic (from 11 to 29) if the true variance is assumed to be twice the measured variance.

Given this new information, the Undercount Steering Committee members reevaluated their positions regarding the report issued on June 21, 1991 * * *

The new information added uncertainty to the decisions of the majority, but their overall conclusions were not changed. In addition, particular sections of the report present representations of committee opinions that are now weakened by the new information. The sections of the report most affected by these new data are:

The statement on page 6 of the report that 39 of 50 States are made more accurate by adjustment would be changed under the new loss function analysis; and

Page 4 of the report summarizes the conclusions of the committee regarding Guideline One. The summary indicates that the majority of the committee relied on the loss function analysis that showed that a large majority of areas were made more accurate by adjustment. This is a stronger statement than the position now held by many of the committee members.

In conclusion the overall committee position has not changed regarding adjustment, but has been weakened somewhat. These new data also underscore the points raised in report's findings on guideline 6 (see p. 12-13). When additional information, as the data presented above, becomes available, the committee acknowledges that it may strengthen or weaken its conclusions. On June 21 the committee judged that further analysis would be unlikely to change its conclusion. The majority stands by its original conclusion while acknowledging that the ongoing work, had it been

available by the date our recommendation was due, may have caused different "weighing" of the results.[128]

These eleventh-hour findings weakened a key piece of evidence favoring adjustment. Because of these two significant errors, my concerns about the sufficiency of data and the strength of analysis supporting adjustment were heightened.

A second example of the pressures of the schedule is that as of the afternoon of Thursday, July 11, 1991, just two working days before my decision would have to be announced, I received a communication from Ericksen and Tukey taking issue with some of the conclusions in Wachter's report. Although I understand that many of the issues surrounding adjustment will be debated for a long time to come, the fact that some of the members of the Special Advisory Panel feel it incumbent upon themselves to offer last minute advice reinforces my perception that a full professional airing of issues has not taken place. Wachter wrote a speedy response to Ericksen and Tukey which I received on Friday, July 12, 1991. But a last minute debate by letter is not the way to carry out the important dialogue required on these issues.[129]

Over the course of the next months and years the data will be studied, the models tested, the professional discussions joined. We do not know what will be discovered about the quality of the PES data and the models that led to the adjusted counts. I am sure that the Census Bureau will

---

[128]Addendum, page 6-7.

[129]Both letters are contained in Appendix 16.

not compromise its richly-deserved reputation for thorough and careful research. We need those efforts to build toward a better census in the year 2000.

But the question is whether we should adjust the census based on the data and incomplete analysis that we have now. As Wachter notes, we must "strike a sensible balance between the need to reach closure and the need to check and study further."[130] The decision must be made on its merits.

Notwithstanding my concerns about the effect the July 15, 1991, deadline had on research efforts, I conclude that sufficient data exist to permit me to decide whether to adjust the census. I conclude that the data support a decision not to adjust. Among the facts that weigh against an adjustment are:

• The PES missed a significant number of persons whom we cannot locate. Thus we cannot judge whether the adjusted census is distributionally superior to the enumeration simply by putting back into the count those we can locate by the PES.

• At the most aggregate level, the PES would move the count of the population in the opposite direction for some demographic groups as compared to those implied by DA.

• There is no convincing evidence to suggest that the adjusted counts give a more accurate count of the distribution of the population across various levels of geography. In fact

---

[130]Wachter, page 46.

the evidence indicates the census counts probably yield a more accurate measure of the distribution of the population.

• There is no convincing evidence that homogeneity within the poststrata used in adjusting the census counts is a statistically valid assumption.

• There is evidence that the estimates of the population produced by adjusting the counts are sensitive to small changes in the estimation procedure and these have significant effects.

Thus I find that the evidence presented is sufficient to conclude that the counts should not be adjusted.

Conclusion

An adjustment to the census is a fundamental change in the way we count and locate the persons residing in the United States. I am deeply concerned that if an adjustment is made, it would be made on the basis of research conclusions that may very well be reversed in the next several months. That would be bad for the country and bad for the Census Bureau.

The results of the PES evaluation studies are not yet completely analyzed. Because of the compressed time schedule imposed by the July 15 deadline, the analysis has not been subject to the full professional scrutiny that such important research requires and deserves. To the Census Bureau's great credit, the statistical tools used to calculate and evaluate the adjusted counts are at the cutting edge of statistical research. But such cutting edge research is not tried and true--it requires more thorough scrutiny before it

can be used to affect the allocation of political representation and Federal funding.

Nonetheless, the demands of good research must be weighed against the need for a timely decision. In time we may find a way of combining the PES and the census to create counts that better reflect the absolute levels and the distribution of the population. There are sufficient data and analysis to support a decision not to adjust.

Guideline Seven

The decision whether or not to adjust the 1990 Census shall take into account the potential disruption of the process of the orderly transfer of political representation likely to be caused by either course of action.

Explanation

This guideline is intended to ensure that the factor of disruption of the process of the orderly transfer of political representation is explicitly taken into account as the decision is reached. For example, many states have pointed to adjustment as being disruptive to their redistricting plans. Likewise, members of some communities that are believed to have been historically undercounted contend that if the Census were not adjusted, this would disrupt the orderly and proper transfer of political representation to their communities. The inability to ensure accuracy of counts at local levels may result in politically disruptive challenges by localities to official census counts.

This guideline recognizes that the Decennial Census plays a pivotal role in the orderly redistribution of political

representation in our democratic republic. The process used to generate the required counts must not be arbitrary either in fact or appearance. The Secretary is thus obliged to consider the impact of his decision on the fairness and reasonableness of that redistribution to all those affected. This guideline requires an explicit statement of how and to what degree adjustment or non-adjustment would be disruptive. Even though these are concepts that are not easily quantifiable, they warrant serious consideration in order for the Secretary to make a prudent decision on an issue that profoundly affects public policy.

Discussion

Among the primary purposes of the census are to provide the basis for the reapportionment of the House of Representatives and the drawing of new Congressional district lines within states. Census figures are also used by most states to redraw state legislative district boundaries, as well as by cities and counties in redrawing their own districts.

The Clerk of the U.S. House of Representatives has officially certified to each of the fifty states the number of seats allotted to the state for the 103rd Congress based on the census figures released on December 26, 1990. As of May 1991, some 20 States had already enacted either or both of their Congressional and State legislative redistricting plans. The U.S. Department of Justice is reviewing approximately one dozen of the state plans as well as those

of many cities and counties to ensure compliance with the requirements of the Voting Rights Act.[131]

If adjusted census counts were issued, Congress would have to decide whether to change the apportionment for the 103rd Congress which is to be elected in November 1992. If there were a decision to change the apportionment using the formula in current law, the Clerk would have to issue new certificates to the states advising them of the number of seats to which they would be entitled based on adjusted counts. If this change were made, the States of California and Arizona would gain one seat each and the States of Wisconsin and Pennsylvania would each lose one seat relative to the apportionment previously certified by the Clerk of the House.

It is unclear whether Congress would change the apportionment even if adjusted counts were chosen. The requirements of the statutes governing apportionment were fully met in January with the certification of the number of seats to each state. Thus, as noted in a number of public comments[132], additional action may be required on the part of Congress to change that apportionment. Whether, how, and when that action would be taken is for the Congress to determine.

---

[131]See appendix 12. Turner, Marshall, "Planning the 1990 Census Redistricting Data Programs," U.S. Bureau of the Census, [hereafter Turner].

[132]See the summary of public comments on Guideline Seven in appendix 8.

It is important to remember, however, that the modern apportionment process was designed to be automatic. Once the counts were transmitted by the President to the Congress, the apportionment took place without legislative action. This design was intended to put an end to the blistering fights over apportionment that occupied earlier Congresses and, in fact, prevented reapportionment after the 1920 census, depriving citizens of a fair allocation of political representation throughout the nation for the remainder of the decade.[133] The adjustment of the Census might well create similar bitter disputes and paralyzing legal challenges over the apportionment of the 103rd Congress. The political implications of this are matters of substantial concern.

If the adjusted census were the basis for a reapportionment of the House, for the first time, the apportionment would not be determined solely on the basis of the number of persons within each State's border. This is due to the effects of cross-state groupings of post-strata in the PES on the adjustment process. For example, if the counts were adjusted, the certified population count for Delaware would depend on the results of the PES in Maryland, the District of Columbia, West Virginia, Virginia, North Carolina, South Carolina, Georgia and Florida. This is because Delaware is in the South Atlantic census division, and PES estimates are developed division-wide.

At the State level there is also likely to be confusion, disruption and extended litigation if the census figures are

---

[133]See the discussion of this matter in Chapter Six of Margo J. Anderson, The American Census: A Social History. New Haven and London: Yale University Press. 1988.

adjusted. Members of the Special Advisory Panel reported on extensive testimony they received from members of the National Conference of State Legislators in Baltimore, Maryland on June 28, 1990.[134] The testimony focused on the effects of an adjustment on the states' ability to accomplish redistricting in compliance with state-imposed legal deadlines. Witnesses were concerned that the electoral process would be paralyzed by the endless litigation which two sets of census numbers would be certain to provoke. Witnesses cited major problems with adjustment: costs and delays in drawing new plans, costs of additional elections, the need for costly special legislative sessions, time constraints, and charges of partisan tampering with census data. Based on the testimony, it is clear that adjustment would create serious disruption for at least a dozen states that have early redistricting schedules or constitutional deadlines. Some states have simply delayed starting the process until after the adjustment decision. As Estrada recognized, adjustment also would require modification of recently designed districts to meet one-person, one-vote requirements.[135]

Protracted legal battles that preclude redistricting in time for the 1992 elections would deprive minority groups and others the opportunity to realize and benefit from the gains achieved through demographic shifts during the past decade. The same pattern would likely occur in redistricting efforts for city and county elections, which have already begun in a number of areas. Moreover, the adverse effects of an adjustment on the accuracy of small area counts (as

---

[134]Tarrance, page 28 and Wachter, page 47.

[135]Estrada, page 23.

demonstrated in the discussions of Guidelines One through Three) would likely result in politically disruptive challenges by localities to adjusted counts.

Several public commentators, as well as Tukey,[136] noted that such disruption was foreseeable at the time of the Department's decision to consider an adjustment and that anticipated effects should not be considered in making the decision. The fact that disruption could be anticipated does not mean that it should be ignored. Indeed, consideration of disruption as a factor to be weighed in the decision was legally upheld. Moreover, as Tarrance stated, "we would not be responsible stewards of the public trust if we do not understand that we are considering more than just a scientific statistical improvement of an imperfect government program."[137] Because the census is the basis for allocating political representation in our country, the public policy implications of adjustment, including resulting political disruption, had to be considered in reaching this decision.

The potential for disruption as a result of an adjustment must be weighed against any disruption that would occur from a decision not to adjust. There will inevitably be litigation resulting from a decision not to adjust that may also delay or disrupt redistricting. Some public commentators claim that the unadjusted census is itself disruptive because it does not ensure certain groups of their rightful claims on political representation and Federal funding. These claims rely fundamentally on the conclusion that the adjusted counts better reflect the distribution of the

---

[136]Tukey, page 2.

[137]Tarrance, pages 2-3.

population. As explained in the discussions of Guidelines One, Two and Three, the evidence supports the contrary conclusion.

Estrada asserted that the public good is better served by focusing on the potential benefits to millions of persons rather than on the limited number of Congresspersons and state legislators who would be affected by a decision to adjust.[138] As demonstrated previously, the evidence indicates that millions of Americans may be harmed rather than benefit from an adjustment. Moreover, we must remember that the Congresspersons and state legislators who would be affected by an adjustment are elected by and represent millions of Americans in the political process.

Comments by members of the public and by Estrada[139] noted that an adjustment would result in more equitable allocations of federal funding to states and cities, a consideration which in their view must be weighed against any disruptive consequences from adjustment. Again, this claim assumes that the adjustment provides a more accurate distribution of the population across states and localities, an assumption which is not warranted by the evidence.

Moreover, it has been demonstrated that an adjustment of the census would have very little effect on the distribution of Federal funds. The study in Appendix 15[140]

---

[138]Estrada, page 24.

[139]Estrada, page 23.

[140]See appendix 15. Murray, Michael, "Census Adjustment and the Distribution of Federal Spending," U.S. Bureau of the Census, May, 1991, [hereafter Murray].

shows that less than one fifth of one percent of Federal funds would be reallocated as the result of an adjustment. Twenty-one or fewer states would receive additional funds from an adjustment. Fewer than half of all jurisdictions would be allocated additional funds as the result of an adjustment. As the study demonstrates, those jurisdictions that do benefit would receive on average only $56 in additional funds per "adjusted" person.

Thus, even if the claim that an adjustment would more accurately (and thus fairly) allocate federal funds were valid, the adjustment would not result in significant shifts of those funds.

Conclusion

Any decision will result in some level of disruption through legal challenges. On balance, the record indicates that a decision to adjust would likely be more disruptive than a decision not to adjust. A decision to adjust would clearly cause disruption in those States that have early redistricting deadlines. The assertion that persons are denied their rightful claims without an adjustment assumes that the distribution of the population is improved by an adjustment. Based on the evidence, this assumption is invalid. Thus, this guideline weighs in favor of a decision not to adjust.

Guideline Eight

The ability to articulate clearly the basis and implications of the decision whether or not to adjust shall be a factor in the decision. The general rationale for the decision will be clearly stated. The technical documentation

lying behind the decision shall be in keeping with professional standards of the statistical community.

Explanation

It is the responsibility of the government to have its critical decisions understood by its citizens. We recognize, however, that the degree to which a decision can be understood cannot alone dictate an important policy decision.

The decennial census is a public ceremony in which all usual residents of the United States are required to participate. If the census count were statistically adjusted, the rationale for that action must be clearly stated and should be understandable to the general public. If the decision were made not to adjust, the elements of that decision must also be clearly stated in an understandable way. It will be the responsibility of the Department of Commerce and the Bureau of the Census to articulate the general rationale and implications of the decision in a way that is understandable to the general public.

This does not require the Bureau or the Department to explain in detail to the general public the complex statistical operations or inferences that could lead to a decision to adjust. But, as with any significant change in statistical policy, the government has the duty to explain to the public, in terms that most can understand, the reason for the change. If the decision is not to adjust, (that is not to change) the public will be informed as well.

The last part of the guideline ensures that the methods, assumptions, computer programs, and data used to

prepare population estimates and adjustment factors will be fully documented.

The documentation will be sufficiently complete for an independent reviewer to reproduce the estimates. These standards apply to the post-enumeration survey estimates, the demographic analysis estimates, and the small area synthetic estimates.

Discussion

The general rationale for this decision is clearly stated in the first section of this report. The technical documentation underlying this decision is in keeping with the professional standards of the statistical community. Thus the Guideline has been satisfied.

However, the Guideline could have been met if the decision had been to adjust. The Census Bureau has done a laudable job of keeping the public informed of the progress of the post-enumeration survey and the progress towards the adjustment decision. There is no doubt that the process of adjustment is complex and the statistical details of the process are fully comprehended by only a few individuals. Although I am sympathetic with these arguments, this would not have been an impediment to an adjustment. The general rationale could have been clearly articulated. As Estrada notes, the public perception of the census "head count" is far removed from the actual process,[141] yet the general rationale for the census is well understood.

---

[141]Estrada, page 24.

Conclusion

The requirements for this Guideline have been met. This Guideline does not weigh in favor of a decision either way since the requirements of this Guideline could have been fully met if the decision had been to adjust.

SECTION 3--SUMMARIES AND EVALUATIONS OF THE RECOMMENDATIONS OF THE SPECIAL ADVISORY PANEL

In this section I summarize the individual recommendations of each of the members of the Special Advisory Panel appointed to advise me on this decision, and the joint recommendation offered by Drs. Ericksen, Estrada, Tukey, and Wolter. After each summary I evaluate each recommendation.

Recommendation of Eugene P. Ericksen

Summary of the Recommendation

Ericksen recommends an adjustment. His argument relies substantially on a report co-authored by himself, Estrada, Tukey, and Wolter. He argues as follows: An adjustment will reduce the substantial error in the census and will correct for the differential undercount. The Bureau produced a demonstrably inaccurate census enumeration which can be fixed by means of PES estimates. PES estimates have been demonstrated to be both accurate and statistically reliable by evaluation studies of the 1990 decennial census. The racial differential undercount has

again been demonstrated in the census, and the PES can correct for this clear and important bias.[1]

On Guideline One, Ericksen reports from his jointly authored analysis and other analyses that it is clear the adjusted count has been shown to be more accurate than the original enumeration. In Ericksen's view there is little doubt that the original enumeration is inaccurate. He states that the Census Bureau reported 13 million erroneous enumerations, 19 million omissions, and a PES net undercount rate of 2.1%.[2]

Ericksen says the basic flaw of the original enumeration is that it uses a method "designed for the well educated, middle-class family with reliable mail service." He argues that the method does not work for "those who do not read well, who live doubled up in an apartment, who live in drug infested neighborhoods with high crime rates, and who only occasionally receive mail." The procedure had such well demonstrated flaws that the 4.7 million undercount, and the 4.4% demographically estimated differential, was not surprising.[3]

Ericksen states that the PES was successful. The interviewing quality was high, imputation was minimal, and the matching error was very small. The evaluation studies suggest that the total error in the PES was minor. Correlation bias suggested that the PES underestimated the

---

[1]Ericksen, p. 1.

[2]Ericksen, p. 2.

[3]Ericksen, p. 2.

undercount, if anything. "The only reasonable conclusion is that the adjusted count is more accurate than the unadjusted count."[4]

On Guideline Two, Ericksen states that the adjusted data are consistent, complete, and of sufficient quality to be used for all purposes and at all levels for which census data are used. He cites the jointly authored report.[5]

On Guideline Three, Ericksen finds that "under any reasonable basis of comparison, the PES-adjusted enumeration is more accurate than the unadjusted enumeration."[6] The PES estimates are robust with respect to evaluation strata, and the effect of the PES biases on population shares is negligible. The estimates for the states whose Congressional delegation size might be changed by an adjustment are stable.

On Guideline Four, Ericksen says it is difficult to comment because of the lack of evidence. He interprets the available evidence from a National Opinion Research Center (NORC) study to suggest that most Americans would like to have the most accurate census and will trust the experts to make it so.[7]

---

[4]Ericksen, p. 3.

[5]Ericksen, p. 3.

[6]Ericksen, p. 3.

[7]Ericksen, p. 3.

Ericksen has no expert opinion on Guideline Five but notes that Jefferson lamented the lack of accuracy in the first census.

On Guideline Six, Ericksen feels sufficient data are available to make the decision now. Sampling errors for local estimates are reasonably small, and the PES evaluation studies indicate that bias is small.

On Guideline Seven, Ericksen admits having little comment. As a scientist he feels it is better to use improved numbers when available than to rush ahead and make errors.

On Guideline Eight, Ericksen believes that the results can be explained, and the technical documentation is in keeping with professional standards.

Evaluation of Recommendation

I agree the census had an undercount. I also agree that the evaluation studies demonstrated that the PES was well done. I do not agree, however, that the PES has the ability to correct distributional error. The grounds for my disagreement have been documented in the discussion of Guideline One.

I agree that the adjusted count, if more accurate, has been shown to be more accurate in a numeric sense at the national level. I do not agree that the adjusted count is more accurate in the distributional sense at lower levels of disaggregation. In addition, the erroneous enumeration and

omission figures cited are Census Bureau estimates, which vary according to definition.[8]

The census used a variety of methods, including mail-out/mail-back, list enumerate, and list leave to fit different lifestyles. Class membership, education level, and reliability of mail service may explain some, but not all, of the census coverage problems. Recall that the personal enumeration censuses of 1940, 1950, and 1960 had even higher estimated undercounts. Thus, I disagree with Ericksen's notion that the census was "designed for the well educated, middle-class family with reliable mail service."

I do not agree that successful PES operations imply that the statistical manipulation required to go from its data to 4,830,514 blocks in order to produce a better count is a routine, automatic operation. I disagree that PES data, which are informative about the census, *can* be used to change the census in ways that make it distributionally more accurate.

I do not agree that merely because the Census Bureau can produce data that completely duplicate enumeration tables, that those numbers are of sufficient quality to be substituted for the census enumeration.

---

[8]The numbers used by Ericksen are estimates derived from all P-sample misses (19,171,290) and all E-sample "Erroneous Inclusions/Unmatchable." (13,154,639) While defensible, this is but one extreme definition. For example, it does not take into account the role of Census imputations. The matter of estimating these two components is a matter of disagreement among professionals. See, for example, the discussion in a Memorandum from Howard Hogan to Pete(r) Bounpane entitled "Gross Census Errors," July 2, 1991, Bureau of the Census on these issues. See the discussion of this issue under Guideline One above.

I agree that the PES adjusted enumeration may be more accurate numerically. I do not agree that it is distributionally more accurate. While the estimates are robust for evaluation strata, there is considerable doubt cast on their homogeneity with respect to post-strata relative to states.[9]

I appreciate Ericksen's comments on Guidelines Four and Seven, although I do not agree with them. I agree with his comments on Guideline Eight. I agree with his comments on Guideline Six, except that sufficiency of data in Guideline Six has nothing to do with substantive outcome, as Ericksen's comments about the size of sampling error would seem to imply.

Recommendation of Leobardo F. Estrada

Summary of the Recommendation

Estrada recommends in favor of an adjustment. Estrada first spells out a general rationale for his decision which is followed by an exposition of his reasoning for each guideline. Estrada relies on the paper co-authored by Ericksen, Estrada, Tukey, and Wolter.

Estrada's general rationale begins with the observation that the 1990 census is sufficiently flawed to require adjustment. In particular, the undercount rate increased from 1980, the census omitted the largest number of persons ever, historical undercount differentials between

---

[9]See P12, and the discussion of Guideline Three above.

blacks and non-blacks persisted, and the black non-black differential actually increased from 1980 to 1990.[10]

Estrada states that the observed pattern of undercount is consistent with prior censuses. The Census Bureau efforts to overcome the undercount in the enumeration failed for a variety of reasons relating both to the character of the population and to the nature of the census operation itself. "While the Census Bureau was able to improve its internal management systems, the national dynamics that comprise the U.S. became more complex."[11]

Estrada argues that the differential undercount was the real cause for concern. He asserts that it occurred due to a number of problems in census processes. Flaws in the census operation included inaccurate mailing lists, non-delivery of census forms, a lower than expected mail return rate, inadequate interviewer and enumerator staffing levels, delay in district office closings, enumerator errors, enumeration by last resort, missing data, the inclusion of 2 million non-data defined persons in the count, lack of non-English language forms, processing errors, lost forms, race and ethnicity misclassifications, geocoding errors, and duplicate records.[12] District offices in the largest cities with the most heterogeneous populations suffered more from these flaws than others resulting in more last resort, close-out and non-data defined enumerations among non-Hispanic blacks and Hispanics.

---

[10]Estrada, page 2.

[11]Estrada, page 3.

[12]Estrada, pages 4-6.

Estrada states that the cumulative effect of all these problems is that the 1990 census needs adjustment.

Estrada describes the post-enumeration survey (PES) as a high quality process. He ascribes the high quality of the PES to, among other things, on-site listing of livable structures rather than reliance on mailing lists in sample blocks, experienced interviewers, a non-response rate of less than 1% and a proxy response rate of only 2.4%, relatively early interviewing to overcome the forgetting problem, successful tracking of the 8% of the PES who were movers, the successful evaluation program, and the fact of matching or resolving non-match cases for 98.3% of the 173,000 housing units surveyed.[13]

Estrada says that PES estimates of undercount follow known and expected patterns; *i.e.*, blacks higher than non-blacks, young males among minorities most often undercounted, the West division higher than other divisions, Hispanics highest rates of all. This attests to the "reasonableness" of PES undercount estimates and shows consistency with demographic analysis.[14]

Estrada claims the quality of the dual system estimates is sufficiently high to justify their use, according to the Hoaglin and Glickman sensitivity analysis among others.

Estrada says that adjustment methodologies improve the proportional distribution at all levels of census

---

[13]Estrada, pages 6-8.

[14]Estrada, pages 8-9.

geography. He relies on the Tukey work and the work of other consultants that show that improvement at higher levels of geography improves shares at lower levels.

These conclusions by Estrada end the general rationale section of his recommendation The remainder of Estrada's recommendation focuses on each guideline.

On Guideline One, Estrada begins by reviewing the results of the Census Bureau evaluations of the PES, the so-called P-studies. The missing data studies (P1, P2 and P3) show that the rates of noninterview are low and the imputation for the primary populatior. items was also low. Alternative means of imputing missing data did not affect post-strata. A Special Advisory Panel (SAP) analysis shows that post-stratum shares are minimally affected by eight alternative ways of handling missing data, with one exception. Given the small number of imputations required for the PES, alternative methods would have small effects on the outcomes.

Estrada says that the matching error studies (P7 and P8) confirmed that the high quality of clerical matching and matching of movers was performed successfully.

Estrada writes that the correlation bias studies (P13, P14, and P17) show strong correlation bias in the PES. Although for some this casts doubt on the dual system estimates, for him there is another side to the coin--"the undercount would be underestimated, particularly for minority populations. Whether the underestimation of undercount caused by correlation bias balances the biases toward overestimation of the undercount caused by missing

data needs to be investigated, but the chances are they offset each other."[15]

Estrada states that other studies of data quality from the PES (P4, P5, P5A, and P6) show that the PES was not seriously impaired by problems of the quality in the reported census day addresses or fabrication.

Estrada says that those studies related to erroneous enumerations (P9, P9A, P10) show that erroneous enumerations were concentrated in particular evaluation post-strata. The census had higher rates of erroneous enumerations in minority areas and rural areas. Some significant changes would have occurred had matching of cases reported as erroneous enumerations been done by expert matching. On the census side there was a low error rate in matching, but more detailed analysis indicates that erroneous enumerations due to matching were more likely in two evaluation post-strata--non-minority areas outside the central city in the Northeast and West.[16]

Estrada claims that the study on late-late census enumerations (P18) shows that the addition of these data had an insignificant effect on the undercount rate. Similarly, balancing error was not a problem.

Estrada believes that the total error model (P16) indicates that errors introduced in the PES were small and tended to equalize racial differentials in the undercount.

---

[15]Estrada, page 14.

[16]Estrada, page 16.

On Guideline Two, Estrada states that a strong argument can be made that the requirement for local area accuracy can be satisfied by showing that adjusted counts are an improvement on the average for the principal uses of census counts. He claims it is appropriate to judge the adjusted counts at higher levels of aggregation than the block.

Estrada acknowledges that the Census Bureau study on heterogeneity (P12) shows mixed results with respect to the homogeneity assumption with respect to poststrata. "The research 'flags' the need to be aware of State effects [overwhelming poststrata effects]."[17]

On Guideline Three, Estrada acknowledges that the Census Bureau study on coefficients of variation (P15) showed that estimates of variances and covariances for smoothed and unsmoothed adjustment factors were larger than expected. However, he cites the Hoaglin and Glickman study as demonstrating the robustness and stability of the dual system estimators under different statistical treatments.

On Guideline Four, Estrada argues that if the Secretary adjusts using the best tools available, the reputation of the Census Bureau will be enhanced. The census process must incorporate adjustment as its final step. Estrada interprets the National Opinion Research Center (NORC) poll as indicating that the decision to adjust is slightly more likely to improve participation in future Censuses.

On Guideline Five, Estrada states that the innovation of adjustment is in keeping with prior Census Bureau efforts

---

[17]Estrada, page 19.

to meet the intent and spirit of the Constitution. The courts have already held that adjustment can be Constitutional.

On Guideline Six, Estrada states that "all the proposed studies have been completed, the data tables made available and the Census Bureau has had sufficient time to fulfill the concerns set out by [this guideline] in time for the Secretary of Commerce to make his decision."[18]

On Guideline Seven, Estrada states "Without denying the fact that there are State officials who feel imposed upon and elected officials (and potential challengers) who suffer from uncertainty as to when the boundaries of their districts will be 'fixed,' the actual consequences [of the census being adjusted and these figures not being available until July 15, 1991] are that a couple of Congressional seats will shift from one State to another; that delays will occur in redistricting, and that edges of many recently designed districts will have to be slightly modified to meet the one-person, one-vote requirements."[19]

Estrada says these disruptive consequences must be weighed against the fact that a census adjusted for deficiencies will provide a more equitable allocation of persons to each district, and a more equitable allocation for all other census purposes. The public good is better served by focussing on the potential benefits of adjusting the census to millions of persons rather than on the limited number of Congressmen and Congresswomen and legislative officials

---

[18]Estrada, page 23.

[19]Estrada, page 23.

who will be affected by the July 15, 1991, decision to adjust the census and the subsequent release of adjusted numbers.[20]

On Guideline Eight, Estrada states there is an implicit assumption that the public understands the standard census methodology. However, their perception of what the census is--is far from the real census. Thus, both the real census and the reason for adjusting the census must be understood by the public. The public must understand the context of the PES in the census process. An informed public will accept the need to adjust if provided with concepts to understand the logic of the method.[21]

In conclusion, Estrada notes that the census has suffered from a persistent differential undercount. The evidence overwhelmingly demonstrates that the census count can be improved by adjustment. The PES adjustment factors have an advantage over demographic analysis in providing more specificity about the undercount. Adjusted counts will be more equitable and assure equal representation. Therefore, the Secretary of Commerce should adjust the census.

Evaluation of Recommendation

I do not agree that it follows that even were the 1990 census sufficiently flawed to require an adjustment, an adjustment is possible. The facts cited comparing 1980 and 1990 are a necessary, but not sufficient, grounds for considering an adjustment. A methodology must be

---

[20]Estrada, page 23-24.

[21]Estrada, pages 24-25.

available that will achieve a successful distributional correction.

I agree that the differential undercount is regrettable, and a cause for serious concern. I do not agree with Estrada that the flaws cited in the census are tied directly to that undercount. I agree that no matter how the differential came about, one would want to fix it *if one could*.

I agree that the PES was successful. However, I do not agree that the PES estimates followed all expected patterns. For example, in the discussion of Guideline One, above, serious questions are raised about its success in finding black males, and its "over compensation" for older females. In fact, PES results are frequently inconsistent with demographic analysis.[22]

I believe that the Hoaglin and Glickman study can be interpreted to show not robustness, as Estrada says, but that it can be interpreted to show that thirteen different models produce thirteen different sets of adjusted counts. These counts may have been close to one another, but not necessarily be an improvement over the census. Furthermore, as I noted in the discussion of Guideline Two there are other sources of variation due to statistical modeling.

I do not agree that the conclusions reached with respect to the Panel correlation bias studies are as clear as Estrada asserts. As Special Advisory Panel member Wachter suggests, the undercount may be underestimated by correlation bias effects not because of differential misses, but

---

[22]See the discussion of Guideline One above.

by differential erroneous enumeration rates when holding misses constant.[23]

I believe that Estrada's discussion of erroneous enumerations reaches the opposite conclusion from what the studies find: Differential erroneous enumeration rates by evaluation post-strata are a cause of concern, because they leave open the real possibility of differences between processing offices in how well the PES was carried out.

I agree that the total error model is experimental, but I disagree that the expression "total" is appropriate. Not all errors are included in it, only those errors that could be estimated on the basis of the PES. While the study of total error is encouraging, it is not yet dispositive with respect to the utility of the model.

Estrada acknowledges that P12 shows mixed results with respect to heterogeneity of post-strata. Thus, his assertion that requirements for local area accuracy are satisfied by "average improvement," and that only higher than block levels of aggregation need be considered, seems to me to contradict his acknowledging that local area accuracy needs to be satisfied. In fact, heterogeneity at the block level would mean that Guideline Two has not been satisfied.

As noted earlier, I believe that the Hoaglin and Glickman study can be interpreted as demonstrating a clear lack of robustness: Since accuracy at the block level is the goal, a process that allows thirteen different models to produce thirteen different estimates that differ only a little

---

[23]Wachter, pages 12-13.

from one another, is not adequate. Differing a little at the high level of aggregation of the Hoaglin and Glickman work may mean differing dramatically at the block level.

I do not agree with Estrada's comments on Guideline Seven. The adjustment, as envisioned, will, in fact, not provide a more equitable allocation of persons to districts as he assumes. In my opinion, the lack of distributional accuracy is precisely why the adjustment is flawed as a correction for the census counts.

I do not agree that adjusted counts will be more equitable as Estrada claims in his discussion of Guideline Eight. In fact, they will not be more equitable distributionally, which is the criterion for determining whether an adjustment would improve the accuracy of the counts.

Recommendation of William Kruskal

Summary of Recommendation

Kruskal recommends against an adjustment. He uses the word "modification" rather than adjustment since the latter term suggests to him that "we really know how to improve the Census enumeration."[24] The primary reason for recommending against adjustment is that "we do not know with any confidence how to make such improvements . . . and we will not know in a relevant time scale."[25] Although "the proposed modifications are clever and technically

---

[24]Kruskal, page 1.

[25]Kruskal, page 1.

interesting, the method turns on highly specialized assumptions and we simply do not know how robust the output results are against realistic errors in those assumptions."[26] The proposed modifications are complex, impossible to explain clearly for a general audience and their use is "likely to increase already existing apprehensions about manipulation and big brotherism in Washington."[27] The modified estimates might well introduce more error than they clear up, without anyone being aware of such an imbalance.

On Guideline One, Kruskal contends that there is no conclusive evidence that the modification removes more error than it introduces, and does not expect any convincing arguments anytime soon. The major gap in assessing comparative accuracy is the uncertainty about the "capture-recapture" model.[28] The implicit assumption of uniform capture probability is the most troublesome. Knowledge about the degree of output error caused by the non-factuality of this assumption "is just what we do not have, indeed cannot have, for the post-enumeration process."[29]

Later Kruskal notes that Guideline One calls for the highest professional judgment from the Census Bureau. "The highest level of professional judgment requires vigorous argument and discussion not only within the Bureau

---

[26]Kruskal, page 1.

[27]Kruskal, page 1.

[28]Kruskal, page 2.

[29]Kruskal, page 3.

but in groups made up both of Bureau and outside statisticians and others. That vigorous and public discussion we have not had in nearly adequate amount."[30]

On Guideline Two, Kruskal's only comment is that synthetic adjustment is based on a simplifying assumption that is known to be wrong, which in turn throws great weight on the calculations of stability, given reasonable error structures.[31]

On Guideline Three, Kruskal's impression is that "choice of the so-called smoothing procedures was profoundly based on post-enumeration survey (PES) results,"[32] which is not in keeping with the guideline. He questions whether "that in *major* respects the choice of procedure was made before the PES results were in hand," but time did not permit a full investigation on his part.

On Guideline Four, Kruskal feels the extraordinarily complicated procedures will undercut public confidence in the census. On Guideline Five, Kruskal has no comment. On Guideline Six, Kruskal believes that "timely data and analysis are not really at hand."[33] On Guideline Seven, Kruskal does not see how "this cuts in the present context."[34] On Guideline Eight, public explanation will be difficult

---

[30]Kruskal, page 5.

[31]Kruskal, page 3.

[32]Kruskal, page 4.

[33]Kruskal, page 5.

[34]Kruskal, page 5.

because of the complexity and the choice of one of many such methods available.

Kruskal notes that the Guidelines "tilt against modification," but "that is hardly novel."[35]

Without resting his views solely on the guidelines, and instead on his "partly formulated and internalized professional criteria, along with [his] internalized civic standards,"[36] Kruskal still recommends against an adjustment. He expresses concern about the large numbers of estimated counts and the inherent problem of putting together the millions of estimated differences between the count and the adjustment. He closes by noting that modifications that increase counts can, in fact, harm, by moving the proportions of the population in a given area in the wrong direction.

Evaluation of Recommendation

I agree that the census modifications lack robustness. Thus, Kruskal does not interpret the Hoaglin and Glickman studies as do plaintiffs' panel members. He recognizes that the adjustment may introduce more error than they correct without anyone knowing it.

I agree with Kruskal's criticism of the "capture-recapture" model upon which the DSE is based. He notes, in particular, that its assumption of uniform capture probability is most troublesome.

---

[35]Kruskal, page 5.

[36]Kruskal, page 6.

I agree with Kruskal's belief that there has not been an adequate vigorous and public discussion of the merits of adjustment. However, I disagree with his statement that the lack of such a discussion means we are not able to determine whether Guideline One is adequately met.

I disagree with Kruskal that, in terms of Guideline Three, there was no prespecification. He asserts that smoothing procedures were based on PES results. His comments implies a standard that would, in Guideline Three terms, preclude ever meeting prespecification requirements.

I agree with his comment that increasing counts can move proportions of the population in a given area in the wrong direction. That comment means that he, too, is concerned with the problem of distributive accuracy, and that he shares a concern about whether the proposed procedures deal with it adequately.

Recommendation of Michael McGehee

Summary of Recommendation

McGehee strongly recommend[s] that no adjustment be made to the census. There is no compelling evidence that suggests that the PES [post-enumeration survey] will provide estimates that are any closer to the true population totals for the eight million blocks in the United States. Indeed. there is significant evidence to suggest that adjustment will move the population of many blocks further away from their true populations.[37]

---

[37]McGehee, page 6, emphasis in the original.

Persons have always been missed in the census for a variety of reasons. Statistical adjustment is the most recent proposal to address the situation.[38]

McGehee states that adjustment numbers are estimates just like census counts: there is no way to determine which is closer to the true population, other than assumption and judgment. The evaluations of PES data "rested on pre-conceived assumptions of how the data would appear."[39] The results often fell outside the lim its predicted from these assumptions. Rather than accepting the conclusion that the process is flawed, the assumptions were modified. He has no confidence in this reasoning. He refers to the problem in computing margins of error (variances) for local estimates as an example of this problem. "It is a strong indictment of the entire process, however, when evaluation procedures are not clearly understood by those using them * * *. The entire process has tended to produce more, rather than less, uncertainty."[40]

McGehee gives, as an example of the uncertainty created, the large difference in production matching effectiveness rates between Albany and Kansas City (87.20% v. 93.49%). Why this discrepancy exists is unknown and "no documented evidence can be presented which clearly explains this problem."[41] Adjustment proponents will argue that in the aggregate these problems are small and thus "the

---

[38]McGehee, page 2.

[39]McGehee, page 3.

[40]McGehee, page 4.

[41]McGehee, page 4.

differences at lower levels should be overlocked because they become insignificant at the aggregate level."[42] McGehee disagrees, pointing to Guideline Two requiring accuracny across all jurisdictional levels. Furthermore, variation at the aggregate level, McGehee contends, is discounted by proponents by modifying the assumptions upon which the conclusions have been based.

"Decisions made during the DSE process, and the assumptions on which they stand, dramatically alter the adjustment results. A politically 'better' count cannot be defended if it is shown that the assumptions on which it rests are changeable."[43] Because of the widespread use of census figures, they must be defensible. The Bureau has maintained public confidence in its numbers over the years by "its meticulous approach to detail and its dogged adherence to maintaing the quality of Bureau data as the true standard."[44] Adjustment will undermine the public's confidnece in this track record. A decision to adjust should be treated as political, and be forced to undergo the same Congresional scrutiny as other such decisions.

McGehee continues his argument by discussing the capture-recapture methodology. He uses an analogy to compare the PES to counting bears in a game preserve. He notes that the heterogeneity in game wardens' background and abilities, in the types of bears and their physical characteristics and in the terrain will lead to differences in

---

[42]McGehee, page 5.

[43]McGehee, page 5.

[44]McGehee, page 6.

how well the bears are counted. In similar ways, the enumerators' characteristics, the characteristics of the population the enumerator is counting and the environment in which the enumerator is working will all have effects on the outcome of the PES. These problems are compounded by the fact that PES records must be matched back to the census and the ability of matchers may be heterogeneous.[45] To identify tghe weight given to each of these variables, regression models are used to determine their individual effect. How these regression models are specified in the PES process is constantly changing. How to combiene these variables into a larger number and how to cmpare various strata are issues of judgment on which individuals may differ.[46]

McGehee says that comparisons of data to the "correct" or "true" population are often made. The "correct" population is derived from a series of assumptions and thus results are simply theories. After reviewing the data, it is clear that the proposed adjustment does not meet the criterion of being usable across all jurisdictional levels nor is it robust at local levels to reasonable alternatives. The idea of using the PES to adjust the census is so complicated and so subjective, that no reasonable person can agree that it should be contemplated or that the process will be explicable to the general public.[47]

---

[45]McGehee, pages 8-10.

[46]McGehee, page 11.

[47]McGehee, page 12.

McGehee next turns to the issue of comparing the accuracy of the PES to the Census. Matching PES and census records is the key to assessing the relative success of the PES and the census in counting people. His "analysis shows that the PES fails to demonstrate a 'better' record of counting people than the Census. Indeed in many instances it cannot demonstrate that it did *as well* as the Census."[48] In support of his assertion McGehee presents a cross tabulation of census match codes by race and ethnic origin. He also does so for the PES. Although "time does not permit extensive analysis of thid data,"[49] he does note that twice as many Hispanics in the census left the race question blank as in the PES. More Hispanics identifie4d themselves in the category "other" in the PES than in the census. "On a superficial basis, the results raise very significant questions whether adjustment will, in fact, yield greater accuracy than the census."[50]

McGehee states that the rationale for using the PES to correct the differential undercount rests on the assumption that as the black population increases in each block cluster, the PES will do a better job than the census in counting people.[51] It is appropriate then to compare the "best" and "worst" census and PES numbers within each block cluster and see how these comparisons change as the concentration of blacks increase over clusters.

---

[48]McGehee, page 14.

[49]McGehee, page 19.

[50]McGehee, page 19.

[51]McGehee, page 20.

McGehee argues that since errors occur in both the census enumeration and the PES survey, judgments had to be made as to whether it was correct to include them. These judgments are critical in determining the success or failure of the PES or the census. In those cases where judgments were made, one can get a range of estimates of quality by assuming that all judgments should have gone in favor of omission and, alternatively, all judgments should have gone in favor of inclusion.[52] Best and worst confidence level scenarios for the census and the PES in each block cluster are carried out. These comparisons are displayed by ranking the results in order of the proportion of blacks in the cluster, since research indicates "that as the percentage of black population within a cluster increases, the effectiveness of census coverage decreases."[53]

McGehee uses six graphs to present these results. "When comparing the best census scenario with the worst PES scenario one sees that the census does a dramatically better job of correctly counting people than the PES. . . . What is surprising, however, is the potentially dramatic performance shown by the census in those clusters where the black population is between 50% and 75%. Even more surprising is the very close correlation between the census and the PES in clusters where the black population is greater than 80%. In fact, the Census has a higher confidence level than the PES in those clusters where the black population is between 80% and 85%. This flies in the face--and graphically demonstrates the fallacy--of the argument put

---

[52]McGehee, page 21.

[53]McGehee, page 26.

forward by the proponents of adjustment."[54] The PES does not necessarily outperform the census. Even if one accepts the midpoint between the best and worst PES results, the census exceeds this level and the PES does not outperform the census in clusters containing a large number of blacks.[55]

McGehee then turns to the guidelines. In his discussion of Guideline One, he finds the entire concept of adjustment on "the outer limits of statistical research."[56] The assumptions underlying the evaluations of the PES are so arbitrary and fluid that little weight can be attached to their assessments of PES quality. Therefore, Guideline One cannot be met since one cannot prove that the PES is better than the census.

On Guideline Two, he notes that variances between processing offices and evaluation strata are outside expected levels and at the district office level there was such variation it could not be reconciled. Adjusted numbers are inconsistent at the State, city, and subcounty level and suffer from serious quality concerns.[57]

On Guideline Three, McGehee asserts that the adjusted counts have not been shown to be more accurate than the census enumeration. The determination of quality is dependent on many assumptions and judgments.

---

[54]McGehee, page 28.

[55]McGehee, page 29.

[56]McGehee, page 31.

[57]McGehee, page 32.

McGehee says that the manipulation of assumptions in evaluation studies undermines confidence in all ongoing statistical data collection and therefore Guideline Four cannot be met.[58]

McGehee claims there remain legality questions about adjustment that need to be answered with respect to Guideline Five. On Guideline Six, McGehee states that sufficient data are available to suggest that the PES was flawed and the analysis of the data is insufficient to justify a decision to adjust the census.[59]

On Guideline Seven, McGehee finds that the mere fact of a possible adjustment has caused consternation and difficulties in state legislatures. The lack of consensus on the desirability and statistical feasibility of adjustment will result in extensive legal battles.[60]

Finally on Guideline Eight, McGehee asserts that the entire process is so complicated and difficult to understand, even by professionals, that a general rationale cannot be clearly justified. To the degree that the process is explained successfully people will become aware of the kind of manipulations underlying it and the integrity of the statistical process will be forever compromised. Adjustment is to correct an inequity, which is not a statistical problem but a

---

[58]McGehee, page 33.

[59]McGehee, page 33.

[60]McGehee, page 34.

political and societal problem that should be dealt with by the Congress.[61]

Evaluation of Recommendation

I agree with McGehee that the results of the PES fell outside expectations. The error variance around local estimates are an example of this problem.

I agree with McGehee's citing large differences in production matching effectiveness between processing offices as indicators of uncertainty rampant in the PES data. However, evaluation studies of the PES have not found the kind of systematic effect alleged.

I disagree that the link between the Bureau's credibility and its aversion to schemes that tend to devalue the census itself is a reason for avoiding adjustment.

I agree with McGehee's criticisms of the capture-recapture methodology. He raise issues not brought out elsewhere that cast doubt on its validity for use on human problems. I agree with his notion that characteristics of interviewer, interviewee, and setting interact to affect the quality of information, and find McGehee to persuasively elaborate the idea. I believe that McGehee's ideas support criticisms of Kruskal and others that the method is flawed fundamentally.

I disagree that if an adjustment were made it would not be explainable to the public. Since the decision not to

---

[61]McGehee, page 35.

adjust is just as complicated, this statement does not seem to have merit as an argument against adjustment.

Although I concluded that an adjustment would degrade the quality of the population distribution as compared to the census, I do not agree with McGehee's explanation of why the PES did not do as well as the census. He presents an analysis showing that, in a sample of block clusters, as the percentage of blacks within a cluster increases, the census actually performs better than expected. McGehee claims that this analysis casts serious doubt on the argument that *ipso facto* a PES based adjustment will necessarily reduce the differential undercount of blacks. I find his argument at best anecdotal and not compelling.

I agree with McGehee's conclusions that, on the basis of his analyses, arguments for adjustment based on Guidelines One, Two, Three, and Six are not adequate: The census remains more accurate than the PES; adjusted numbers are inconsistent at different levels of geography, and the quality of the PES is too dependent on assumptions, not facts and analysis.

McGehee argues on Guideline Seven that disruption is already occurring. This argument lacks support. He cites no evidence that adjusting or not adjusting will differentially contribute to disruption. Thus, I find that his arguments that this Guideline argues against adjusting are not relevant.

I disagree with his belief that the technicalities cannot be explained. Rather, I note that the process has been open, the Bureau has gone to great lengths to document its activities, so that there was no lack of ability to explain adjustment.

Recommendation of V. Lance Tarrance, Jr.

Summary of Recommendation

Tarrance recommends against an adjustment. He has chosen to concentrate on the public policy implications of a decision, not only because it is his area of expertise but also because he is "convinced that the impact of changes to the enumeration totals on the operations of our government--at the federal, state and local levels--would be disastrous."[62] Tarrance's lengthy introductory remarks are followed by a discussion of the guidelines.

Tarrance states that the perception that if the Bureau discovers how many persons it missed it should be an easy task to correct census results is incorrect. In fact, there is no consensus on how to fix the counts among statisticians or other experts. Two Gallup polls--March 1990 and April 1991--show no consensus on including estimates of missed persons in the count. Whites were evenly split; non-whites preferred a synthetic adjustment.[63]

Tarrance says that more important than the statistical quality of the numbers is the public policy aspects of an adjustment. These include "the paralyzing difficulties that changing the numbers will cause in accomplishing redistricting . . . for all levels of the electoral system; the damaging perceptions that will be given to the public about the two different sets of numbers from the census; the troubling uncertainties surrounding even statistically-

---

[62]Tarrance, page 1.

[63]Tarrance, page 2 and Appendices.

acceptable numbers . . ."[64] Such policy difficulties should not be dismissed as many proponents of adjustment have done.

Tarrance asserts that lost in the debate fostered by adjustment advocates are the following points of decisive importance: (1) The adjustment process is complex, not well understood, without precedent and evaluations of it are judgmental; (2) synthetic estimates below the State level will never be more accurate than census counts; (3) the deadline of July 15, 1991, has not allowed enough time for adequate evaluation of the adjustment process or its product; (4) two sets of numbers may create "chaos" for the 1992 elections; (5) the trust in census confidentiality and the belief in the need to cooperate with the census will be further eroded; (6) resources may be denied to future census activities because "adjustment will take care of all problems" will be the expedient prevailing attitude; and (7) accepting adjustment will invite "'inside manipulation' of numbers for political purposes."[65]

Tarrance says that "The adjustment process being used can produce an array of different results depending on the choice of assumptions and/or statistical methods employed. . . ."[66] Thus, the issue is not technical, but judgmental, as the decision calls for an assesment of the consequences of a decision. Whatever the decision, litigation will ensue, but a decision against adjustment "may

---

[64]Tarrance, pages 2-3.

[65]Tarrance, pages 4-5.

[66]Tarrance, page 6.

be the beginning of a more reasoned look at the problem."[67] The Constitution says Congress shall determine how the census is to be conducted; therefore Congress should settle this issue, if at all possible, rather than the courts.

Tarrance quotes a statement made by co-chair Ericksen in 1980: "The undercount adjustment procedure needs to be statistically sound and politically credible," and goes on to state that the controversy has increased, in fact, and Ericksen's 1980 position is even more compelling today. Given the confusion and possibly paralyzing effects of adjustment, the best solution is not to adjust the census today, but to consider the proposal to adjust intercensal estimates as is done in Australia, Finland, and Spain.

On Guideline One, Tarrance first notes that statistical sampling only produces accurate results when sample sizes are sufficiently large, and for small jurisdictions this is simply not the case. Some small area counts will be made less accurate by an adjustment and the question is how we deal with such areas. There are a host of questions about tradeoffs among communities in accuracy that remain unanswered.

Furthermore, he points out that accuracy is a point of fundamental definitional differences between law and statistics: law needs certainty, statistics accepts a range of uncertainty about numbers it still considers accurate. "Any court settlement directing adjustment will *necessarily* require the arbitrary choice of numbers which have been derived from methods that statisticians would ordinarily hedge about. . . . It is paradoxical that those same interests who

---

[67]Tarrance, page 7.

are faulting the Bureau of the Census for not having counted all persons are at the same time putting inordinate trust in that same agency to transcend the limits of statistical 'estimating!'"[68]

Tarrance argues that:

The important fact that is buried in the mass of rhetoric about the need to correct inequities resulting from undercounting is that the numbers will undoubtedly be less accurate for many areas below the state level. The reality is that the adjustment process will not find those persons who were missed by the original enumeration and include them where they were not counted before. . . . Some correctly counted blocks could have persons added to their count; some correctly counted blocks could have persons deleted from the census count, and incorrectly counted blocks might not have any changes made to their numbers.[69] In addition, the post-enumeration survey (PES) is not able to handle all forms of counting errors with equal adequacy. Thus, misallocation can still occur even with adjusted numbers. Ultimately, "the final numbers are chosen from a range of possibilities that are dependent upon the choice of assumptions; there is a great deal of 'inside' judgment involved, and although [he has] no reason to doubt the experts at the Bureau of the Census who ahve had to make the hard choices, it is still troublesome that there is an

---

[68]Tarrance, page 13.

[69]Tarrance, page 13, emphasis in the original.

opportunity for different results to be obtained by the use of different methods or assumptions."[70]

On Guideline Two, Tarrance states that a lack of usability for redistricting is a major deterrent to proceeding with adjustment, because of the conflicts having two sets of numbers will generate. "The realities of redistricting at the state and local level, combined with the possibilities for endless litigation, are such that it would be naive to believe that synthetic numbers will be usable . . . for the purposes of redistricting and reapportionment."[71] With two sets of numbers, redistricting plans will likely end up in court and the likelihood of "chaos" for the 1992 elections seems ever more probable.

On Guideline Three, Tarrance is most troubled by "the acknowledged fact that different methods using different assumptions produce different results."[72] As an example he notes that small numerical differences lead to large consequences in reappportionment and redistricting. "It is all too obvious that the procedures being used will not produce robust numbers and that it would be possible to obtain an array of population counts which could have very different effects upon apportionment."[73]

The requirement for pre-specification in Guideline Three concerns Tarrance, as some procedures were

---

[70]Tarrance, page 16, emphasis in the original.

[71]Tarrance, page 18.

[72]Tarrance, page 19.

[73]Tarrance, page 19.

prespecified and some were not. In particular the decision not to combine demographic analysis with the PES was made by staff, in stream. This is an example of an attitude of "if the numbers don't come out the way we think they should, we can change plans" which is "diametrically opposed to what good government policy should allow. Furthermore it is clear that the adjustment process is a statistical operation which has never been done before and there are many last-minute decisions being made."[74] Tarrance expressed uneasiness that "special interest pressure to adjust was pushing an incompletely researched or insufficiently tested statistical operation to a very shaky end".[75]

On Guideline Four, Tarrance states that a decision to adjust would have a far-reaching impact on future census efforts. Future censuses might be adversely affected as the Congress might well cut census funds, using the logic that an adjustment will fix the count anyway. Mayors and other local officials would question the necessity for their efforts on behalf of the census. The adjustment controversy might very well erode the already tenuous confidence of the public in the Census Bureau. The controversy surrounding the count should lead to imaginative ways to take the census in 2000, such as rolling samples, the "bare bones" head count, *etc.*; and legislative proposals immediately after the adjustment decision.

On Guideline Five, Tarrance states that Congress should determine how the census is to be conducted as

---

[74]Tarrance, page 21.

[75]Tarrance, page 22.

required by the Constitution. Congress could also direct program solutions to resource allocation inequities.

On Guideline Six, Tarrance is convinced that the entire process has been rushed in an attempt to meet an arbitrary deadline. There has not been enough time for the evaluations. Given the controversy and that a general consensus has not developed, the adjustment should not be done without "the most exhaustive study and analysis of the data," which there has not been enough time to do.[76]

On Guideline Seven, Tarrance notes that the Special Advisory Panel met with representatives of the National Conference of State Legislatures. Technicians who must do the redistricting believe that they will be "paralyzed" by the "endless litigation" two sets of numbers will provoke if the census is adjusted,[77] although the very existence of two sets of numbers may be problematic. An adjustment would be most threatening to the creation of redrawn electoral districts for the 1992 elections.

Adjustment, according to Tarrance, will set a precedent for adjusting future censuses. He notes that one person miscounted in the PES represents from 500 to 1,000 persons that would be added or subtracted to develop adjusted numbers. The opportunity for, or perception of, manipulation to achieve desired ends will remain, but once adjustment is routine and not subjected to the scrutiny that it is now, the rigor of public examination to assure that

---

[76]Tarrance, page 27.

[77]Tarrance, page 28.

manipulation does not occur will wane, and the risk, therefore increase.[78]

On Guideline Eight, Tarrance states that few people, even expert statisticians, really understand the process being used. He offers several examples of procedures and results of adjustment that are not well understood and states that it is impossible to articulate the complicated statistical procedures to the average person.

Evaluation of Recommendation

I disagree with the implication of Tarrance's discussion of public policy considerations that results of polls should play a substantial role for or against adjustment. I also disagree that if there is consensus that a particular adjustment would improve the counts and consensus that the adjusted counts are better than the enumeration, then an adjustment could be done based solely on that consideration.

I agree with Tarrance's point that there is support for not adjusting because of disruptive consequences for redistricting efforts.

I agree with Tarrance that the seven points of importance he cites, *i.e.*, complexity, lack of accuracy of synthetic estimates, inadequate time for evaluation, two sets of numbers leading to "chaos" for 1992, erosion of trust in census confidentiality, adverse consequences for funding future censuses, and the danger of inside manipulation, are valid expressions of concerns affecting the application of Guidelines One, Three, Six, Seven, and Eight.

---

[78]Tarrance, page 29.

I agree with Tarrance's discussions of lack of robustness which occur throughout the discussion. The point is made by him that judgment plays a substantial role in the choice of adjustment procedures. This is a flaw in the adjustment process pointed out in the discussion of Guideline Three, above.

I agree that Guideline One's requirements for accuracy are not met. The problem of misallocating people--even if one counts them correctly at a "higher" geographic level, is raised and documented. I agree that the arbitrariness of outcomes depending upon choice of assumptions is a fundamental weakness of adjustment.

I disagree that two sets of numbers will cause sufficient chaos to make either set not "usable" in Guideline Two terms. This is not the definition of usability intended by the guidelines. In fact, the effects of the numbers, if accurate and usable to the block level, should not play a role in the adjustment decision with respect to Guideline Two. This argument does not raise a bar to adjustment.

I agree that prespecification may be a cause for concern. However, because the prespecifications, such as the decision not to combine demographic analysis and PES results, were professionally done by career Census Bureau staff, I find that they impose no bar to adjustment according to this guideline.

I agree with Tarrance's assertion that adjustment will have an adverse effect on future censuses.

I do not agree that there has not been enough time for the PES evaluations.

I agree with the evidence as cited, including a meeting by the SAP members with representatives of the National Conference of State Legislatures, supporting, anecdotally, a prediction of endless litigation to be engendered by two sets of numbers, if an adjustment is made. I agree that there will be an increasing risk of future manipulation of the counts through adjustments if the precedent is set. This point is acknowledged in the discussion of Guideline Seven, above.

I disagree that the adjustment cannot be explained adequately, should it occur. I believe there is sufficient documentation to do so. I disagree with Tarrance's interpretation of the role of Guideline Eight on this matter.

Recommendation of John W. Tukey

Summary of the Recommendation

Tukey recommends an adjustment. He relies on the same report submitted by and coauthored by Ericksen *et al.* He argues that each and every one of the technical Guidelines are supportive of adjustment and the key Guidelines One and Three are indicative of an adjustment.[79] Tukey addresses the guidelines in the order given here.

On Guideline Four, Tukey states that a decision to adjust will enhance the Bureau's reputation and facilitate future operations, while a decision not to adjust may hinder future census efforts.

---

[79]Tukey, page 1.

Tukey states that the questions raised in Guideline Five have been before the courts several times, and all decisions rendered permit adjustment.

On Guideline Seven, Tukey states that the Guideline must refer to aspects of orderly transfer of political representation that could not be anticipated in March 1990. There are no such aspects.

On Guideline Eight, Tukey states that the Guideline can easily be met. The technical documentation lying behind the adjustment decision is in keeping with the professional standards of the statistical community.

On Guideline One, in Tukey's professional judgment, the adjustments based on the post-enumeration survey (PES) have been prepared based on the highest professional judgment, and are more accurate, both as to numbers and as to shares, than the raw original enumeration

On Guideline Two, Tukey notes that, since the Bureau is preparing consistent and complete counts down to the block level, there is "no bar to adjustment."[80]

On Guideline Three, Tukey says that the Bureau has stuck to prespecified procedures. Dr. Robert Fay and consultants Drs. David Hoaglin and Mark Glickman have done a series of studies testing different statistical models that agree with one another and have proved to be good.

---

[80]Tukey, page 3.

On Guideline Six, Tukey states there should be no questions raised about nonadjustment because of inadequate data by 15 July 1991.

Tukey ends with a post-script that notes that the existence of sensitivity of adjustment to reasonable choices should be no bar to adjustment, as long as it is small. The single prespecified procedure produces small sampling errors in comparison with post-stratum to post-stratum differences in adjustment factors to make it clear that adjustment provides smaller combined error than non-adjustment.

Evaluation of Recommendation

I disagree with the assertion that a decision to adjust will enhance the Bureau's reputation or facilitate future census efforts. In fact, other SAP members assert the opposite.[81]

I agree that Guideline Five is not a bar to a decision to adjust.

Tukey's interpretation of Guideline Seven, while unique, would not change the role this Guideline plays in the adjustment decision.

I agree Guideline Eight can be met.

I disagree that the analysis of Guideline One indicates that the Guideline has been met with respect to shares. Since the adjustment must clearly be shown to be superior to the census, controversy over this very important role played

---

[81]McGehee, page 6; Tarrance, pages 4-5.

by census numbers indicates that the Guideline has, in fact, not been met.[82]

I disagree with Tukey's argument that Guideline Three has been met. In particular, I disagree with his interpretation of the Hoaglin and Glickman study, which he says supports the homogeneity assumption. As noted above, it can be used to support a conclusion that variance is a serious problem with the synthetic estimation model.

I agree that Guideline Six can be met.

I disagree that small differences between alternate sets of adjusted figures are no bar to adjustment, given the requirements to adjust to the block level with distributive accuracy.

Recommendation of Kenneth W. Wachter

Summary of the Recommendation

Wachter recommends against an adjustment. He "conclude[s] that the requirements for accuracy, state and local usability, and robustness articulated in Guidelines One, Two, and Three are not met by the adjusted counts. The broader considerations in Guidelines Four through Eight also, on balance, do not favor a decision to adjust. [He] therefore recommend[s] against adjustment of the 1990 U.S. Census counts."[83]

---

[82]See the discussion in Guideline One above.

[83]Wachter, page 2 of cover letter.

On Guideline One, Wachter concludes that the adjusted counts are not satisfactory. Although:

> evidence indicates that the adjusted counts are more accurate at the national level, the relative sizes given by adjusted counts are probably less accurate for a number of [S]tates and surely less accurate for a substantial fraction, possibly a majority, of local areas for which [c]ensus counts are to be used."[84]

As a preface to detailed sections on Guideline One, Wachter makes several pages of general observations:

> The adjustment of a census is difficult as it is a matter of changing the counts for 6.8 million blocks. A post-enumeration survey (PES)-like survey is usually used to generalize up from sample totals to population totals; for such a use the absolute size of the sample rather than the fraction surveyed would limit the accuracy that could be achieved. The PES is used by the census to generalize down, which is a much more demanding process.
>
> Three things must happen for the PES to be successful. The PES operation must be good, the people missed in the Census have to be reached by the PES, and the reasons why people are missed must be knowable so that one can extrapolate from the people and places analyzed to all the rest, for the PES to improve the census enumeration. The first has happened, the second has not, and the third is in doubt.[85]

---

[84]Wachter, page 1, emphasis in the original.

[85]Wachter, pages 1-2.

The quality of the PES is high. There are problems and limitations but no disasters. Thus the first criterion is met.

A substantial portion of persons missed, net, by the census were not within reach of the PES. Discrepancies between estimates of national undercount between the PES and demographic analysis by age and sex for blacks and non-blacks cannot be explained away by plausible allowances for uncertainty. Half the black males who are missed, net, in the census are being missed, net, in the PES. There is no direct information on the distribution of these people from place to place.

As to the third criterion, the answers are not yet clear-cut. There is insufficient homogeneity at different levels of disaggregation for post stratum for the adjusted numbers to be usable. Erroneous enumerations are numerous and prominent in the adjustment picture. Block level data and district office data do not support the assumption of homogeneity.

Different smoothing procedures should lead to similar answers with respect to adjusted versus enumeration counts, but they do not: they lead to markedly different answers.[86]

Combining census and PES data produces results that are better than either alone only if we know enough about the precision and accuracy of each part. This is an empirical, not an *a priori*, question.

---

[86]Wachter, page 3.

His personal experience with census enumerators and PES enumerators suggests that, contrary to common wisdom, census enumerators may very well have done a better job than PES enumerators in a significant class and number of cases.

[He] do[es] not believe that any highly aggregated index or loss function is appropriate for summing up overall accurary. It is informative to understand how much the outcomes of calculations with different versions of such aggregated indices differ. But the choice among them is not a scientific choice. Each such index involves implicit value judgments about different sorts of error. For example, each index determines whether a few large errors are more serious than a great many smaller errors. *Whether we agree with a particular tradeoff is a matter of personal and political values. It should not be disguised as science.*[87]

The census is the source of small-area data, so accuracy at that level has a special claim although some sensible balance of concern and perspective for level of detail is required.

In the first section devoted to Guideline One, Wachter considers national discrepancies between the PES and demographic analysis. There is a national undercount, although Wachter takes issue with the uncertainty intervals about the point estimates of the undercount. There is also credible evidence of a differential undercount. Although the evidence from the demographic analysis and the PES agree as to the existence of broad differentials, "the evidence as to the pattern by age and sex for blacks and non-blacks does

---

[87]Wachter, page 5, emphasis in the original.

not agree."[88] According to the demographic analysis, a high undercount rate for black adult males, ages 20-64 exists. This does not occur in the PES which means that "*a large portion of the people probably missed by the Census were also missed by the extrapolation from the PES that produced the adjusted counts.*" He calls these people "unreachable."[89]

Wachter estimates the numbers of unreachable people to be large, perhaps half-a-million. Since nothing is known about their location, the huge numbers of "unreachable" people mean relative population sizes based on adjusted counts cannot be shown to be more accurate than those based on census counts at any subnational level.[90]

Wachter then turns to patterns in the estimates of net undercounts for post-strata. The patterns of adjustment factors for the 1392 post-stratum groups show regular patterns at higher levels of aggregation, but unexpected complexity when examined stratum by stratum, suggesting heterogeneity where there should be homogeneity. Analysis "for aggregates mask a large amount of diversity within groups, and the story of census coverage, at a level of fine detail, is more complicated than one would hope."[91]

Wachter then turns to the proximate determinants of net undercount. He finds that "erroneous enumerations account for a large portion of the variations in net

---

[88]Wachter, page 9.

[89]Wachter, page 7, emphasis in the original.

[90]Wachter, page 9.

[91]Wachter, page 10.

undercounts across areas and post-strata."[92] Erroneous enumerations play a powerful role in determining the net adjustments to the counts, and this role is masked by smoothing adjustment factors which is probably unjustifiable.[93]

Wachter suggests that variation in erroneous enumeration could be the result of coverage improvement programs. The evidence that can be gleaned from comparing the cities of Detroit and Chicago is mixed. The main conclusion that can be drawn is that "erroneous enumerations are extremely varied. . . . [However,] lumping Detroit and Chicago together in the same post-strata, as the PES does, ignores sizable differences in coverage patterns."[94]

Wachter says that strong correlation between erroneous enumerations and omissions is insufficiently understood, even though it contributes substantially to the size of net undercounts. Since erroneous enumerations exceed omissions in a good number of post-strata, there will be a goodly number of downward adjustment. Thus "*people who themselves filled out their Census forms correctly may be 'minused out' of the Census to compensate for others who were erroneously enumerated*" to calculate an adjustment. "There may be no statistical objection to such a process. But on a human level it is offensive."[95]

---

[92]Wachter, page 11.

[93]Wachter, page 10.

[94]Wachter, page 13.

[95]Wachter, page 14, emphasis in the original.

Wachter asserts that there remain uncertainties in the demographic analysis, although it has been much improved.

Wachter states that the total error model does not mean all relevant errors for assessing the accuracy of a PES are included. Rather it addresses errors at the level of the evaluation strata only and, furthermore, treats them separately with no joint error structure. There is no simple way to generalize from the evaluation strata to small areas.

The approach is novel, pioneering and controversial. Thus, the "confidence intervals" around error components are not what statisticians usually mean by confidence intervals. The total error model actually estimates only a portion of the possible sources of error in undercount estimates. Components missed are of unknown magnitude. Stratification is applied inconsistently and some of the uncertainty estimates are themselves subject to large uncertainty. The total error model is too optimistic with respect to uncertainties attributed to imputation.

For Wachter, the main lessons drawn from the total error model are that the confidence intervals for most of the non-minority strata are compatible with zero net undercount, but the intervals for all the minority evaluation strata are not. The higher estimated undercounts are subject to high estimated biases.[96]

Several critical aspects of the total error model results are then discussed by Wachter, beginning with correlation bias or "catchability error." The correlation bias assumptions used are not realistic when applied to the PES.

---

[96]Wachter, page 17.

People stay out of the Census and the PES not by chance, but because they want to. Dual system estimation depends on chance mechanisms. There are many ways to allocate the twice-missed people. Whether the choice made is good is entirely speculative. How the measurement of variance in the total error model reflects correlation bias is not clear. It is better not to attempt any formal allocation of unreached people to local jurisdictions because of these problems.

Wachter next turns to matching and imputation studies. These studies of matching error give estimates of false non-matches that are too low by the very nature of their design. A small test on step-children illustrates the point that because matchers simply apply rules, they may miss true matches.[97] The effects of imputation may also be larger than the evaluation studies indicate. Wachter uses a sensitivity analysis to indicate the bounds on the effects of imputation. It shows that a great deal rests on the correctness of the assumptions in the imputation, but since these assumptions have not been examined, the measures of variance are too low.

On Guideline Two, Wachter sees "substantial obstacles to using adjusted data for Congressional reapportionment" and concludes that adjustment procedures are not well suited for coping with local heterogeneity in census undercounts. Firm conclusions cannot yet be drawn as to the extent of local heterogeneity and its implications for the accuracy of adjusted local counts.

Wachter shows by example that depending on how imputation is done, seats could shift between States in a

---

[97]Wachter, page 21.

variety of ways. In estimating adjusted state population counts, adjustment factors based only on within-State data, rather than factors including across state data affect the distribution of Congressional seats as well. Among the five methods tried by Wachter, each apportionment was different and eleven states either gained or lost a seat relative to the census in at least one of the methods.

Wachter points out that there is acknowledged lack of homogeneity within post-strata. The issue is whether it is so severe to make adjustment locally infeasible. Very little is known about local heterogeneity. Experiments at the block level give ambiguous results with respect to the balance between improvements and worsenings of counts when adjustments are carried down to the block level. However, Wachter concludes that local heterogeneity is a serious problem for adjusting the counts at district office levels and that perhaps a majority of units could be made worse by an adjustment.

Wachter's experiments and analysis convince him that studies of local-level adjustment have "scarcely begun to scratch the surface" of the issue of how local heterogeneity has an impact on adjustment.[28] His block level analysis leads to more puzzles than answers.

On Guideline Three, Wachter finds that reasonable alternatives to one aspect of the smoothing model lead to significantly different adjustment factors and thus the adjustment factors cannot be considered robust. He finds that smoothing has been the most problematic part of the PES and that the smoothing has had more of an effect on the

---

[28]Wachter, page 30.

final adjustment than can be easily justified. The effect of deciding to use pre-smoothed rather than unsmoothed variances in computing smoothed adjustment factors is to raise many adjustment factors by several percentage points, some by more than six percentage points. The changes introduced into the adjustment factors are of the same order of magnitude as the sizes of the adjustment factors themselves.[99] Decisions about pre-smoothing make a large difference and so alternate methods leading to different outcomes seem equally reasonable. In fact, pre-smoothing seems to run the risk of "loading the dice."[100]

Wachter argues that pre-smoothing of variances changes variances in ways that are counter to what one ought to do: reducing large variances increases the weight assigned to empirically unstable factors; increasing small variances reduces the weight assigned to stable factors. In addition, the variance smoothing process is not directed at making covariances more accurate. Furthermore, the choice among regression models is arbitrary in the sense that there is no reason to choose among them, yet the results each set produces differ from one another substantially. Finally, smoothing affects not only adjustment factors, but higher level aggregations of data.

Wachter observes that the effects of the selection of variables for the regression part of smoothing are not negligible but they are not a central issue.

---

[99]Wachter, page 36.

[100]Wachter, page 37.

On Guideline Four, Wachter feels that an adjustment would reduce the stake that individuals, civic leaders and Congressional representatives would have in coverage improvement efforts. Adjustment would increase the political leverage of technical decisions and extra efforts to guarantee the Census Bureau's independence and objectivity would be required.

Wachter offers no guidance on Guideline Five.

On Guideline Six, Wachter states that sufficient data are available for a reasoned decision on adjustment.

On Guideline Seven, Wachter says that disruption is likely as a result of an adjustment, but this should not be decisive for the adjustment decision.

On Guideline Eight, Wachter sees no difficulty in meeting professional standards of the scientific community. The details of the adjustment decision tell against its understandability by the general public. Some dismay when an understanding of what adjustment really is should be anticipated, if the decision is to adjust.[101] Adjustment will have victims.[102]

Evaluation of Recommendation

I agree with Wachter's point that the PES, even if it yields results more accurate at the National level, doesn't improve the distribution of population over the results of the

---

[101]Wachter, page 49.

[102]Wachter, page 49.

census enumeration totals due, in part, to "unreachable" people; among other factors.

I agree with the argument that a good PES is not a sufficient reason to adjust the census. I agree that Wachter's two other conditions are not met, *viz*, people who were missed must be reached, and why they are missed must be knowable.

I agree that Wachter's elaboration of the problem of correlation bias provides insight into why the adjusted counts produced from the PES may be distorted by correlation bias, and not simply underestimate the undercount. There are simply people who are unreachable, and determining why they are unreachable is an insoluble problem.

I agree with the analysis of discrepancies between the PES and demographic analysis.

I agree that the total error model does not include all, or necessarily even most, sources of error. I agree with the criticism that the confidence errors around the components of the model are speculative, and not uncontroversial among statisticians. Pointing out that higher estimated undercounts are subject to higher estimated biases casts serious doubt on the quality of these PES estimates.

I agree when Wachter states that the total error model does not mean all relevant errors for assessing the accuracy of a PES are included. I agree with him as he goes on to say, "Rather it addresses errors at the level of the evaluation strata only and, furthermore, treats them separately with no joint error structure. There is no simple way to generalize from the evaluation strata to small areas. The approach is

novel, pioneering and controversial. Thus, the 'confidence intervals' around error components are not what statisticians usually mean by confidence intervals. The total error model actually estimates only a portion of the possible sources of error in undercount estimates. Components missed are of unknown magnitude. Stratification is applied inconsistently and some of the uncertainty estimates are themselves subject to large uncertainty. The total error model is too optimistic with respect to uncertainties attributed to imputation."

I agree with the discussion of Guideline Two that more work is needed to determine the homogeneity problem at the local level.

I agree with Wachter's conclusions with respect to robustness that interpret findings concerning the output from different models as raising questions about robustness at lower levels of disaggregation. In addition, smoothing is correctly identified as a significant factor affecting outcomes for higher level aggregations of data.

Recommendation of Kirk M. Wolter

Summary of Recommendation

Wolter recommends an adjustment. His analysis relies on the joint paper co-authored by Ericksen, Estrada, Tukey, and Wolter. The corrected counts, as required by Guideline One for an adjustment, are more accurate in both level and distribution at the national, state, and local levels.

Wolter finds Guideline One to be the pre-eminent guideline. His conclusion that the corrected counts are more accurate is based first on the observation that the

post-enumeration survey (PES) is superior to the census by virtue of the design of matching operations and interviewer training and second, because a survey can be more tightly controlled than a census. The evaluation studies demonstrate that missing data, quality of Census day addresses, fabrication, matching, erroneous enumeration measurement, and balancing sources of error were controlled in the PES to very low levels. Correlation bias, while not so well controlled, is an error such that the PES estimates are still closer to the truth. Random error does not affect the utility of PES estimates.[103]

Wolter's rationale for preferring the adjusted counts includes four major points: (1) PES estimated undercounts agree with expectations and with demographic analysis; (2) the total error analysis demonstrates that corrected counts are more accurate for states, counties, and other similar areas; (3) corrected counts for evaluation strata, which are relatively homogeneous, offer even more improvement than they did for states, especially in comparing five minority with eight non-minority strata and central city versus non central city strata; and (4) if the stratum-level undercount rates are accurate, then the corrected counts for local areas must be an improvement on uncorrected counts.[104] This latter result is based on the Wolter/Causey paper that is appended to the coauthored report as Appendix G. Wolter also cites the plaintiffs co-authored report.

On Guideline Two, Wolter states that the bureau is capable of producing adjusted counts down to the block

---

[103]Wolter, page 4.

[104]Wolter, pages 4-6.

level, so the first part of the Guideline is satisfied. As to accuracy at small area levels, Wolter notes that, synthetic estimates of the kind used on the 1990 census can improve accuracy at small area levels so long as measured undercounts at aggregate levels tend to have smaller error than the original enumeration at aggregate levels. In support of his position, he again cites the Wolter/Causey paper. The Bureau's P12 study also offers evidence that the adjusted counts are superior to the census counts at the local level.

On Guideline Three, Wolter argues that the PES adjustment procedures were sufficiently prespecified to satisfy the guideline. The three instances where the procedures were not prespecified were "treated with a high degree of objectivity and professionalism."[105] The Hoaglin and Glickman report demonstrates that corrected counts are robust to variations in reasonable alternatives in the smoothing component of the overall PES process. The Census Bureau P1 study demonstrates that the PES undercount estimates are insensitive to differences in the manner of handling missing data.

On Guideline Four, Wolter states that "it is virtually impossible to say anything about the public's cooperation with the 2000 census."[106] The National Opinion Research Center (NORC) study indicates that the average American doesn't understand adjustment, plans to participate in future censuses, and that the adjustment decision, one way or the other, would have little effect. Other countries have instituted adjustment into their censuses with no adverse

---

[105]Wolter, page 9.

[106]Wolter, page 11.

effect on public participation. Using the most accurate counts is the best way to handle the perception that the adjustment decision is a politically motivated act because Wolter believes that no matter what the decision is--it will be perceived as politically motivated.[107]

On Guideline Five, Wolter acknowledges that he is not a lawyer, but his understanding is that there is no legal ruling that stands in the way of an adjustment.

On Guideline Six, Wolter finds that the necessary data upon which to base the adjustment decision are sufficient, complete and available, and provide a sufficient basis for the adjustment decision.

On Guideline Seven, Wolter finds that the States have been alerted to the possibility of adjusted counts, and can deal with it. The Census Bureau analyses of misapportionment suggests that the original enumeration would misapportion seats more than the adjusted counts. Thus, not adjusting could be viewed as generating more disruption. Wolter is "unaware of any aspect of the 1990 correction process that would cause a truly calamitous disruption of the political process."[108] No part of the correction process has been arbitrary because scientific principles have guided the effort.

On Guideline Eight, in Wolter's view, there is a clear rationale for certifying the correct counts and the Bureau's documentation of the process has been satisfactory. The

---

[107]Wolter, page 11.

[108]Wolter, page 15.

Bureau and the Department should be able to articulate clearly the basis for the adjustment decision

Evaluation of Recommendation

I do not agree that the PES counts are superior to the census counts. The four points of Wolter's rationale for believing the PES superior are flawed Contrary to Wolter, PES undercounts do not agree with expectations, or the demographic analysis.[109] For example, the PES misses half a million black males which demographic analysis says are in the population. The total error analysis deals with numeric, not distributive accuracy. Thus, whatever it concludes about accuracy is not to the point of the form of accuracy which must be demonstrated.[110] The homogeneity assumption is in doubt.[111] There is not agreement on the inevitability of increased accuracy at lower levels, notwithstanding a certain degree of accuracy at broader levels.[112]

I do not agree that the synthetic estimate evidence in support of Guideline Two is clearcut, as Wolter states. In particular, P12 casts serious doubt on the homogeneity assumption necessary to a successful synthetic adjustment.[113]

---

[109]See the discussion in Guideline One above.

[110]See the discussion in guideline 1 above.

[111]See Appendix 2.

[112]Wachter, pages 2-3.

[113]See the discussion of distributive accuracy in Guideline One above.

I do not agree with Wolter's interpretation of the evidence with respect to robustness. I believe that the Hoaglin and Glickman report demonstrated that thirteen different models give thirteen different answers. An outcome of that kind is not robustness in the practical sense demanded by this guideline.

I agree that Guidelines Four and Five are no bars to an adjustment decision. On Guideline Six, I note that some panelists feel there is concern that census studies were not sufficiently analyzed in the time frame agreed to in the stipulation and order.

I do not agree that the Census Bureau analyses of misapportionment of Congressional seats are adequate.[114] I do not agree that there is clear consensus that the states can deal with adjusted counts.[115] In my view, while this does not bar adjustment, it remains a consideration to be reckoned with.

Recommendation submitted jointly by Eugene P. Ericksen, Leobardo F. Estrada, John W. Tukey and Kirk M. Wolter

Summary of the Report on the 1990 Decennial Census and the Post-Enumeration Survey

The authors begin by considering the enumeration. The census differentially undercounts Blacks, Hispanics, Asians, and Native Americans. The Black undercount has

---

[114]See the discussion in Guideline One above.

[115]See appendix 12.

been documented since 1940; the Hispanic since 1980. Differential undercounting is a result of the way the census is taken because it works best for "middle-class suburban" households and worst where living conditions are different. Undercount is strongly negatively correlated with the mailback rate.[116]

The authors state that the original enumeration of the population in 1990 experienced a staggering array of problems. The mail response rate was low, coverage differed between minorities and non-minorities, enumerators gathered less accurate information in cities than in other areas, and nonresponse follow-up operations had a high proportion of last resort and non-data defined responses. The difficulties in enumerating urban areas can be seen from the data. In large city offices 20% of all nonresponse followup was last resort or closeout versus 12% in small city/suburban offices and 11% in rural areas.[117]

The authors claim that last resort and closeout information is incomplete and often inaccurate. More than one-third of all last resort information and 44% of all closeout cases were estimated to be erroneous.[118] Re-enumeration of households originally enumerated by last resort or closeout showed serious errors in certain problem offices. In a national survey of 1,000 one-person households

---

[116]Ericksen, *et al.*, pages 1-2.

[117]Ericksen, *et al.*, pages 4-5.

[118]Ericksen, *et al.*, page 6.

there was between a 20% and 25% error rate depending on the measure used.[119]

The authors say that coverage improvement programs, while adding people to the count, were frequently in error. For example, more than 630,000 of the 2.1 million persons added through vacant/delete either should not have been added at all or should have been added at a different place. More than half (53%) of the persons added to the count through the parolee/probationer check were estimated to have been added in error. Overall, the coverage improvement programs failed to do what they were supposed to--accurately add a substantial number of persons to the census count and the differential undercount remained after the programs had been completed.[120]

In addition to adding error to the count, the authors argue that the coverage improvement programs failed to find the estimated 19.2 million persons actually missed by the census. The "Were you counted" campaign and the Housing Coverage Check and Local review added only 200,000 and 300,000 persons, respectively, to the count. The low number of accurate additions left intact and possibly increased the differential omission rates by race and type of area that had already existed.[121]

The authors next turn to demographic analysis. Demonstrating through demographic analysis that a black

---

[119]Ericksen, et al., page 6.

[120]Ericksen, *et al.*, pages 7-8.

[121]Ericksen, *et al.*, page 8.

non-black differential undercount exists for every census since 1940, the authors conclude that a black non-black differential undercount exists by virtue of demographic analysis in the 1990 decennial census.[122]

Next, the authors turn to the post-enumeration survey (PES). The PES is the mechanism designed by the Census to determine the extent of, and correction for, census error. The post-enumeration survey has demonstrated the differential undercount of the minority population and solved the major error of the original enumeration, which was the inappropriate shifting of shares of population from areas with many minorities to areas with fewer.

The authors state that the PES was a high quality survey. Completed interviews were obtained 99% of the time for the total PES sample, and for major geographic and racial subgroups. Proxy interviews accounted for 2.4% of the total sample, with little variation in this rate across subgroups. Only 1.5% of the P-sample were unresolved in the matching operation, and only 0.9% of the E-sample. There was little subgroup variation.

The authors use three criteria to evaluate the success of the PES: consistency with expectations of the distribution of the undercount (*i.e.* rates of omission and erroneous enumeration should be higher where census taking was more difficult) and the results of demographic analysis; the P studies (looking at missing data and the outcomes of rematch studies especially); and the possible shifting of population if net undercount rates were altered as a result of the P studies.

---

[122]Ericksen, *et al.*, pages 10-11.

The authors state that PES results were consistent with substantive expectations especially when compared with demographic analysis.[123]

The authors' examination of P studies focused on four problems: The effect of variation in assumptions on how to treat missing data; problems due to matching error; problems with census day address misreporting and matching error for movers; and correlation bias. Assumptions about how to treat missing data had little effect. Because the numbers of movers were small, mover matching error had little effect. Correlation bias was a major source of error. Its effect tends to be to reduce estimated undercount. Evidence from evaluation poststrata research shows that adjustment increased the minority share of the nation's population by 0.8%, from 21.4% to 22.2%. The total error model showed a shift of 0.76%.[124]

The next major area considered by the authors was the smoothing of the adjustment factors. They consulted with David Hoaglin to evaluate the impact of the decisions on carrier variable choice, how to smooth variances and covariances of raw adjustment factors before calculating the regression, and how to weight individual observations when calculating the regression.

Hoaglin identified how to smooth the variances before using them to weight observations in the regression calculations and how to smooth the covariances before using them for the same purpose as key decisions.

---

[123]Ericksen, *et al.*, pages 13-14.

[124]Ericksen, *et al.*, pages 12-16.

Hoaglin fitted thirteen different regressions. The first nine were based on three strategies for smoothing variances and three strategies for smoothing covariances (3x3=9); a tenth alternative was suggested by a Panel member; finally for comparison purposes he considered equal weighting of observations; weighting according to raw variances and covariances; and weighting according to raw variances, replacing the covariances by zero.[125]

After considering various alternative "stopping rules" for the "best subsets regression," Hoaglin chose a "back-2" stopping rule which uses apparently the best subset among those involving two fewer carrier variables than are in the set that minimizes the ratio residual mean square/residual degrees of freedom.

Hoaglin used two strategies to test whether the decisions had serious impact on the estimates: The first strategy used the difference in fitted values from each pair among the 13 choices and differences between the 13 and the Bureau's regression fit; while the second strategy used the reallocation of population shares among the 13 evaluative post strata.

Hoaglin stated that alternative smoothing models produced estimated population share gains for minorities that closely "surround the Bureau fit," ranging from 0.48% to 0.77%[126]

---

[125]Ericksen, *et al.*, page 18.

[126]Ericksen, *et al.*, pages 17-19.

Next the authors considered errors for large and small areas. In looking at the differences in errors for large and small areas, they concluded that the total combined error increases as the size of the group decreases (*e.g.*, the combined errors for 5 million blocks will be larger than the combined errors for 1,392 poststrata), and consequently the improvement in amount due to adjustment would be nearly the same for larger and smaller groups--the improvement in percentage terms decreases, but does not change sign, as the groups become smaller.

The authors stated that since the expected CV for a sampling stratum is 1.4%, they were more likely to expect improvements for those areas where undercounts are especially high or especially low. It is these extreme cases where most of the benefit of adjustment is to be expected. Improvements in quite large areas thus prophesies improvements in very small areas, as well as in intermediate areas.

The authors' major conclusions are that error in the uncorrected census was very high; this error disproportionately affected Blacks, Hispanics, Asians and Native Americans; and the PES derived data can be used to correct the census and substantially reduce the differential undercount and improve accuracy at both national and local levels.

Evaluation of the Report on the 1990 Decennial Census and the Post-Enumeration Survey

I do not find the discussion of the quality of the census relevant. Guideline One stipulates that the census is the standard. Thus, irrespective of the flaws in the census,

Guideline One precludes adjustment unless the adjustment is shown to be better than the census by convincing evidence.

I do not agree with the statements in discussions of the PES claiming that PES results were consistent with expectations when compared to demographic analysis is made. There were sizable, and unexpected differences between the PES and demographic analysis which indicate that a PES based adjustment would be inadequate.[127]

I do not agree with the interpretation of the Hoaglin materials. The authors' interpretation misses the point. The issue is not whether the thirteen different outcomes fluctuated around a Bureau estimate of "truth" derived from the PES and are thereby defined as demonstrating sufficient robustness. The very fact of such a variety of outcomes is precisely the lack of robustness that is of concern when using a model based synthetic adjustment at a low level of geography.

The authors state that the expected CV for a sampling stratum was 1.4%. The expected CV was .7%.

I do not agree that PES derived data can be used to correct the census and substantially reduce the differential undercount and improve accuracy at both national and state levels.[128]

---

[127]See the discussion in Guideline One above.

[128]See the discussion in Guideline One above, where the deficiencies in distributive accuracy of an adjusted count, using Census Bureau procedures, are detailed.

SECTION 4--DECENNIAL CENSUS PROCEDURES

In this section I provide documentation for the procedures used to conduct the decennial census, the post-enumeration survey, the evaluation of the post-enumeration survey, and the evaluation of the demographic analysis. Additional information on the post-numeration survey evaluation program and demographic analysis will be found in appendix 3.

1990 Census of Population and Housing: The Bicentennial Census of the United States

Planning for the 1990 Census began in 1984, with planning activities, testing, and preparatory operations occupying the remainder of the decade. Data were collected in 1990, and, as required by law, State population and apportionment totals were delivered to the President on December 26, 1990. The total population count transmitted to the President was 249,632,692, composed of a resident population of 248,709,873 and an overseas population of 922,819.

The Census Bureau was also required by law to deliver redistricting counts and maps to State redistricting officials no later than April 1, 1991. This was done. While the Census Bureau met its two legal mandates for the delivery of apportionment and redistricting data--two of the most important uses of census data--the 1990 census is not considered completed until all planned census data products have been released. Final products will be released in 1993.

The 1990 census involved enumerating 249,632,692 people in more than 100 million housing units, and collecting

a full range of characteristics about each person. Extensive planning and preparation, the successful recruitment and employment of hundreds of thousands of temporary census workers, and an automated management information system to keep track of operations were required to complete the census on time and within budget.

Planning and Preparation

The Census Bureau designed the 1990 census keeping in mind the special problems that arise in the census-taking process, as well as constraints of time, budget, and the need to protect individual confidentiality. Plans incorporated the lessons learned from previous censuses. The plans were tailored to implementation and management by a temporary work force in a compressed time frame. Extensive testing was conducted so that hard evidence could be gathered on the utility of new procedures and techniques. The testing also allowed new procedures and techniques to be refined and adjusted.

Formal planning for the 1990 census began in FY 1984. This early start allowed the Bureau to begin major testing of proposed design features earlier for the 1990 census than for the 1980 census (1984 vs 1976), and to conduct more major tests of proposed features than for prior censuses (e.g., 7 for 1990 *vs* 5 for 1980). Improvements were made in every phase of census-taking. Some were aimed directly at overcoming operational, control, and timeliness problems identified in 1980 census operations. Others were intended to increase the cooperation of hard-to-enumerate groups. These improvements are described in detail in "Planned Improvements in the Counts

for the 1990 Census," April 1989, Bureau of the Census. Improvements included:

• An expanded promotion campaign aimed at hard-to-enumerate groups. For example, for the first time, the Bureau used minority advertising campaigns designed by minority firms, in addition to a more traditional general-audience campaign.

• More cooperation between the Census Bureau and state and local governments. For example, the Census Bureau improved and expanded the Local Review Program, which gives local officials an opportunity to review census counts, by providing training on how to participate in the program, and by instituting two phases of review instead of one, as was the case for the 1980 census.

• Efforts intended to make it easier for people to respond to census questionnaires. For example, the Bureau expanded questionnaire assistance operations for 1990 by offering toll-free telephone assistance in English, in Spanish, and in six Asian languages, and by sending out multilingual "early alert" flyers about the census in selected areas.

• Tailoring census procedures to deal with special or unusual situations. For example, enumerators delivered questionnaires to public housing developments, and the Bureau hired public housing residents to deliver the questionnaires and conduct outreach activities at the same time.

• A greatly increased amount of automation in the census. For example, an automated management information system, in conjunction with an automated address control

file, enabled home office control and monitoring of the 1990 census to deal with developing problems early and rapidly.

• Implementing an automated geographic control system--called TIGER--in cooperation with the U.S. Geological Survey. The TIGER System solved one of the most serious problems of the 1980 census--late, inconsistent, and illegible maps. The TIGER System assured accurate and timely maps and geographic files for the 1990 census.

The 1988 dress rehearsal was the capstone of planning efforts; it was preceded by 5 years of consultation with data users and formal tests of alternative procedures and questionnaire content of the kind just described. The Bureau consulted with a wide range of data users, including minority organizations, planners and academics, business leaders, representatives of private organizations, state and local officials, and Federal agencies.

Once the basic plan for the census, including improvements, was determined, the Census Bureau began to prepare for 1990 data collection and processing. These preparations included map-making, questionnaire printing, address list construction, setting up a field structure of over 500 offices for data collection and processing, procuring and installing automated equipment, and preparing promotion materials.

A critical activity was preparation of a precensus address list. This list was used to determine which housing units had or had not returned a questionnaire in areas where householders were instructed to return their questionnaires by mail. In all, some 100 million addresses were compiled before the census from purchased lists, field canvassing by

census enumerators, and a series of overlapping checks and update operations by census workers, the U.S. Postal Service, and review by local officials.

By March 1990, all preparatory activities had been completed and the data collection phase of the census, which involved attempting to get a completed questionnaire for every person and housing unit in the Nation, was set to begin. (Enumeration of remote areas of Alaska had begun a few weeks earlier in order to complete the enumeration before the Spring thaw.)

Basic Enumeration Procedures

The 1990 census was planned to be a multiphase and incremental process that was to determine the population as of April 1, 1990. Except for remote areas of Alaska, questionnaire delivery or mail-out occurred in March 1990, but the enumeration was not intended to be over then. The Census Bureau built into the census process programs to follow up on housing units that did not return a questionnaire and to ensure that every reasonable effort was made to enumerate every housing unit. These programs extended well after April, into the fall of 1990.

90 percent of the housing units were expected to complete questionnaires and return them by mail. Two procedures were used in such mail-back areas--mail-out/mail-back and update/leave.

For the remaining housing units, householders were instructed to hold their completed questionnaires for enumerator pick-up. This procedure was called list-enumerate. Other special procedures were designed to

enumerate persons who lived in group quarters (such as college dormitories and military barracks) and persons who had no usual residence.

Mail-Back Areas

Mail-Out/Mail-Back

The mail-out/mail-back procedure was used for large cities, suburban areas, and some smaller cities, towns, and rural areas where mailing addresses were house number and street name. In all, about 83 percent of U.S. housing units were in mail-out/mail-back areas. Mail carriers in these areas delivered addressed questionnaires on March 23, 1990, and householders were asked to mail back completed questionnaires by April 1, 1990. Five out of six housing units received a short form containing *only* the questions asked of all housing units; one out of six housing units received a long form with additional questions. One week after mail-out, a post card was sent to each housing unit reminding persons to fill out the questionnaire and return it as soon as possible. This was in addition to the multiple-component promotion campaign, then at its peak.

The USPS returned some questionnaires to the Census Bureau as "undeliverable." The Bureau added a special operation to have census enumerators deliver by hand as many of the "undeliverables" as possible. The remaining housing units did not receive a mailing piece at this time, so they were enumerated during nonresponse follow-up (see below).

Update/Leave

The update/leave method was used in rural areas in the South, Midwest, and Appalachia, where mailing addresses are rural-route designations, or where many householders pick up their mail at lock-boxes. These areas contain about 11 percent of the housing units in the Nation. Here, census enumerators, rather than the USPS, delivered the census questionnaires and, at the same time, updated the address list. This operation began in early March 1990 and continued throughout that month. Just as in mail-out/mail-back areas, householders in update/leave areas were to complete and mail back their questionnaires by April 1, 1990. Again, most units received a short form, but a small pre-designated sample received the long form. Householders in these areas also received a reminder postcard asking them to return their questionnaires.

List/Enumerate

The list/enumerate, or door-to-door method, was used for about 6 percent of the Nation's housing units. These units were primarily in very remote and sparsely settled areas. There was no precensus address list for these areas. Mail carriers delivered unaddressed short-form questionnaires on March 23 and, beginning about April 1, census enumerators went door-to-door listing addresses, picking up completed questionnaires or filling out questionnaires as necessary, and administering the long form at a sample of these units.

Special Procedures

Special place enumeration took place in March and April, 1990. Special places include group quarters, such as boarding houses, nursing homes, dormitories, rectories,

convents, hospitals, etc. Enumerators visited these places to collect information from each resident. About 2 weeks before Census Day, the Census Bureau also conducted a Street and Shelter enumeration (S-night) to collect information from components of the homeless population. The first phase of this operation focused on enumerating persons staying in shelters for the homeless, while the second phase focused on enumerating homeless persons living outside of shelters, for example, on the street.

There were two additional components of special place enumeration: Transient enumeration and military enumeration.

• During transient enumeration, census workers visited travel places where guests are unlikely to have been reported at their usual place of residence, or where guests are unlikely to have a permanent residence. These places include YMCA's, YWCA's, youth hostels, commercial campgrounds, etc.

• For military enumeration, special procedures were used to count domestic military and maritime personnel. Military bases and vessels were self-enumerating. In these instances, bases appointed a senior commissioned officer to serve as the enumeration project officer.

Questionnaire Receipt

Some households received a short questionnaire containing only the questions asked of all households, while others received a long form containing additional questions. About 17 percent (or a sampling rate of about 1-in-6) of the households received the long form. However, in places with

an estimated 1988 population of less than 2,500, the sampling rate was 1-in-2. Based also on precensus estimates, very populous census blocks had a sampling rate of 1-in-8. All other areas had a sampling rate of 1-in-6.

Once questionnaires had been delivered, forms began to arrive by mail in district or processing offices serving each area. Mail returns for some areas went to a processing office for check-in. For most areas, mail returns, as well as questionnaires completed by enumerators during list/enumeration or special place enumeration, went directly to a district office. Both processing offices and district offices used automated equipment to check in forms by bar code scanning of the return envelope. The associated address in the automated address control file was then coded to show that a questionnaire had been received for that unit. At the conclusion of the check-in phase, each listing not coded represented a case that would have to be visited by an enumerator during nonresponse follow-up.

Nonresponse Follow-up

The Census Bureau followed up every housing unit for which a questionnaire was not returned. Daily reports on the mail return check-in rates for each district office were transmitted to headquarters through the automated management information system. This information was used to project the likely workloads for nonresponse follow-up. This overall workload was expected to require over 250,000 temporary enumerators to visit 30 million units over a 2 month-period. By the end of April, the Census Bureau had to estimate the number of persons it needed to hire, and to begin preparing lists of addresses that had not returned a questionnaire. The mail response rate was 63 percent, lower

than the projected 70 percent. As a result of this, the Census Bureau hired more enumerators than it had originally planned for nonresponse follow-up.

The Census Bureau completed nonresponse follow-up for the 1990 census substantially earlier than had been the case for the 1980 census, despite a larger workload. Recruitment goals were met despite the need for more workers engendered by the low mail response rate, and in spite of lower levels of general workforce unemployment than had been the case for the 1980 census.

During nonresponse follow-up, enumerators were required to make up to six attempts to contact a household member and complete a census questionnaire. If this was not possible after three personal visits and three telephone calls at different times and on different days, the enumerator attempted to obtain at least basic information on household member(s) from knowledgeable sources, such as neighbors or building managers.

Because the nonresponse follow-up had to be completed quickly so that other operations could be conducted, each district office was authorized to begin a final phase of nonresponse follow-up once 95 percent or so of the operation had been completed. During this phase, enumerators made one more visit to each remaining case to obtain as complete an interview as possible.

Coverage Improvement Efforts

Basic data collection activities included various steps designed to improve census coverage. Among these were special promotion and outreach efforts, better address listing

procedures, extra efforts to increase mail returns, follow-up on all housing units that did not return a questionnaire, better management of and pay for enumerators, etc. But after basic data collection, census plans also included additional special programs to improve the population count that went beyond standard procedures.

These additional coverage improvement programs, which represent the Census Bureau's policy of giving everyone several opportunities to be included in the census counts, added about 5.4 million persons to the census counts, or about 2.2 percent of the total enumerated population.

Such coverage improvement programs included: (1) The 100-percent recheck of vacant housing units or those identified as uninhabitable or nonexistent; (2) the "Were You Counted" campaign, an opportunity for people who thought they might have been missed to call in or fill out a census form printed in the newspaper; (3) the parolee and probationer check, which involved working with parole and probation officers to get names and Census Day addresses of parolees and probationers and add them to the census had they not already been counted; (4) the housing coverage check, in which the Census Bureau recanvassed selected blocks based on evidence brought to its attention by the automated management information system; and (5) the postcensus phase of the local government review program.

Recheck of Vacant Housing Units and Those Identified as Uninhabitable or Nonexistent

During the follow-up of nonrespondents by enumerators in May through July, some housing units were identified as vacant or uninhabitable; some addresses were

added to the address control file. Each of these units was rechecked by another enumerator in July or August.

Of the approximate 8 million vacancies, the recheck showed 7.6 percent had been occupied as of Census Day, April 1. Their occupants were enumerated at the time of the recheck. This added about 1.6 million persons to the count. Of the approximate 2.9 million units previously identified as uninhabitable or nonexistent, 5.4 percent were reinstated as occupied April 1. These conversions added almost one-half million persons to the count.

"Were You Counted?" Campaign

After the primary data collection, the Census Bureau initiated a procedure to give anyone who thought he/she had been missed the opportunity to fill out publicly available forms or call toll-free 800 numbers that operated in English, Spanish, and six Asian languages. Communities, the media, and many of the 56,000 community-based organizations that had helped initially promote answering the census were encouraged to conduct "Were You Counted?" campaigns, reproduce census-designed forms or promote call-ins to the 800 numbers. The purpose of the campaign was to give a second chance to those who might initially have avoided being counted, or to reach persons not part of the principal family in a household who might not have been listed on the household questionnaire. Initially, the Census Bureau planned to end the campaign by June 30, 1990, but because so many organizations participated, the toll-free numbers were held open until September 30.

In all, about 400,000 "Were You Counted?" calls or forms came into the Census Bureau. Although the majority

of these proved to be persons who had already been counted, the forms did add over 200,000 persons to the census.

Parolee and Probationer Count Check

Research had suggested that a group with a high probability of having been missed in prior censuses were those on parole or probation, a group consisting disproportionately of young males. Thus, in February 1990 the Census Bureau sent letters to the governors and heads of correction departments in each state and the District of Columbia asking them to participate in a program to get parolees and probationers counted. Each was asked to name a liaison to handle the program. Each liaison was sent special individual forms to distribute to their parole and probation officers, who in turn were to distribute them to those under their jurisdiction.

The response rate for the program was disappointingly low--so low in fact, that the Census Bureau sent enumerators to work with parole and probation officers to complete a form for each parolee/probationer with a verified April 1 address. As a result of this activity, it is estimated over 400,000 persons were added to the census.

Housing Coverage Check

With a computerized census that captured questionnaire data as returns came in, it was possible to make additional accuracy checks not possible in prior censuses. In August of 1990, the Census Bureau searched its data bases to identify any blocks or communities for indications of a low count. While the census was still in progress there was time for a further canvass to make

corrections. Population and housing counts, which had accrued thus far for the 39,189 units of local governments, were compared with 1980 counts and recent population estimates. The Census Bureau looked at its data on areas of new construction for possible missed new subdivisions. It also searched to see if the "Were You Counted?" forms showed any pockets of housing that might have been missed. It looked at media reports or local complaints of missed buildings or blocks. Based on these data searches, the Census Bureau decided to recanvass blocks where problems might exist. These blocks represented 15 percent of the Nation's housing units.

Postcensus Local Government Review

39,189 units of local government were sent housing counts and group quarters counts, accrued as of mid-August, to compare with local data. (New updated maps for the communities had already been sent to them in July). Governments were given 15 working days in which to challenge the housing unit or group quarters count for any block. The feedback from local governments was varied. Many took the counts to be final, although the Vacancy Recheck, the Housing Coverage Check--in fact all of the coverage improvement projects done after the primary data collection--were still in progress. All in all, 17 percent of local governments, including all of the 51 largest cities, challenged some blocks, and eight cities challenged over 2,000 blocks. Cities that challenged more than 2,000 blocks in Postcensus Local Review were Atlanta, Boston, Chicago, Detroit, Honolulu, Los Angeles, New York, and Philadelphia.

The recanvass generated by the Housing Coverage Check and Local Government Review yielded new housing units that added over 300,000 persons to the final census count.

The 1990 Post-Enumeration Survey (PES)

Background

The Census Bureau used two major programs to measure coverage for the 1990 census. The first was the Post-Enumeration Survey (PES), which was an independent survey taken after the census and then compared to the census to attempt to measure coverage error in the census. The second program was Demographic Analysis (DA). DA produced an independent estimate of total population by combining information from various sources of administrative data. The process included using historical data on births, deaths, and legal immigration combined with estimates of emigration, undocumented immigration, and Medicare information. Estimates of total population from DA were then compared with census counts to get an estimate of coverage error.

Summary

The PES was a check of the census but not a recount. After the census, interviewers returned to the field to identify all persons living in the sample of blocks at the time of the PES. During the interview, the interviewer asked where each person was living on Census Day--April 1, 1990. This information was then matched to actual census questionnaires. Most people on the PES questionnaires matched to the census. Some did not, and these are the

people estimated to have been missed in the actual census. This part of the PES was called the P-sample. People estimated to be missed based on the P-sample were estimated gross omissions in the census.

People can also be included in the census erroneously. An erroneous census enumeration, for example, could be a child born after April 1, 1990, a person who died before April 1, or a college student away from home who was enumerated at his or her parents' address instead of being correctly enumerated at his or her college. Erroneous enumerations also include persons counted twice in the census. Gross erroneous inclusions in the census were measured in the same blocks as the PES and were called the E-sample.

The data on gross erroneous inclusions and gross erroneous omissions were used to produce an estimate of the net undercount or net overcount of the population in the census. This process is described in the following paragraphs.[1]

Selecting the Sample (Sample Design)

The census attempted to cover all people and was conducted in all blocks. The PES was a sample. The PES sample was selected in stages. First a random sample of blocks was chosen. Within sample blocks, all housing units were interviewed. Within an interviewed housing unit, a PES interview was conducted for each person.

---

[1]For a more detailed discussion of PES see Howard Hogan, "The 1990 Post-Enumeration Survey: An Overview," a paper presented at the American Statistical Association in August 1990.

Since the PES was a sample, if total population estimates were to be calculated based on it, the results had to be generalized to other people not living in sample blocks. One statistical method to improve the accuracy of this generalization process was to classify sample cases into groups (called post-strata) such that within a group, people were as alike as possible with regard to their propensity to be undercounted. Ancillary evidence indicates that undercoverage is worse for males than females; for minorities than non-minorities; for renters than owners, etc. Therefore, these types of characteristics were used to define the post-strata. The Bureau did not know which post-stratum to assign a person to until after the PES interview was conducted. To help insure an appropriate sample size by post-stratum, the blocks in the U.S. were stratified by similar characteristics before selecting the sample blocks from them.

All blocks in the United States were assigned to one of 101 strata. The strata were defined by geography, city size, racial composition, and percent renter. A representative set of blocks was selected from each stratum. A separate sampling stratum was defined for American Indian Reservations.

Persons living in institutions were excluded from the PES, as were military personnel living in barracks, people living in remote rural Alaska, persons in emergency shelters and persons who had no formal shelter. For each of these categories, it was unreasonable to expect to be able to conduct an independent interview in July and match them to their April 1 location.

The eventual PES sample consisted of about 168,794 housing units in 5,290 block clusters that included 12,124 blocks. (See attachment 1, "PES Sample Size by State.")

The sample was designed to achieve a .7 percent coefficient of variation. That is, the level of sampling error was expected to be .7 percent of the level of estimated undercount or overcount. So for example, if the PES estimated the undercount to be 5 percent, it was expected that the sampling error (or margin of error) on that estimate would be .35 percent. In practice, the sampling error was, on average, 1.7 times more than anticipated by the sample design.

Listing and Enumerating

In February 1990, permanent interviewers of the Census Bureau visited each of the sample blocks to list all housing units they contained. To preserve independence, none of the temporary enumerators hired to take the 1990 census was used for this operation; nor was the listing conducted out of the temporary census offices. To maintain independence, the Census Bureau did not want anyone to know where a PES sample block was so that it would be treated differently during the census.

After the completion of the 1990 census follow-up of those housing units that did not return a questionnaire (called nonresponse follow-up), a set of PES enumerators interviewed persons at households in the PES sample blocks. Although this interviewing drew from enumerators who had worked on 1990 census follow-up, steps were taken to preserve independence, such as not allowing an enumerator

to work in a block in the PES that he or she had worked in during the census.

The interviewers determined who was living in each housing unit, obtained their characteristics, and asked where they lived on April 1, 1990, Census Day. The PES interviewing began nearly 3 months after Census Day. Many people had moved during that time. In order to determine whether they were enumerated in the census, the Bureau needed to know where they lived on Census Day and, thus, enumerators asked a series of probing questions to determine occupants' Census Day addresses.

There was a quality assurance program for the interviewing phase to ensure that the interviewers really visited the household and that the people listed were indeed real. If interviewers made up people, they would not match to the census and would inflate the undercount rate.

Matching

The next step was to match the persons enumerated during the PES (the P-sample) to the census. The matching operation was the first step in determining whether persons in the P-sample were enumerated by the census or missed. Basically those persons in the P-sample matched to the census were considered to have been enumerated; those nonmatched were considered to have been missed.

Matching was carried out in four stages. It involved an initial stage of computer matching followed by two stages of clerical matching to attempt to resolve cases that the computer could not match. The two stages of clerical

matching were differentiated by the level of skill and judgment required to establish a match.

Those persons in the P-sample not matched to the census by computer and the first two stages of clerical matching were assigned for a follow-up interview, if it was determined that additional information was necessary to establish whether a match to the census was appropriate. An additional fourth stage of clerical matching was then conducted that allowed the more skilled clerical matchers to use the information from the follow-up interview to establish additional matches.

First, the matching classified people as included in the census only if they were counted at the address where they should have been counted, according to the information they provided. This concept was called "correct address" matching. For example, census rules required that a college student be enumerated at the university dormitory, not at his/her parents' home. The PES counted the student as "enumerated" only if he/she was counted at the university. If he/she was not counted at the university, then the student was classified as "omitted" even if he/she were counted at home. In order for the estimation to work out, the enumeration at home was classified as erroneous and subtracted from the census. So in this example, there would have been one omission (at the university) and one erroneous enumeration (at home). The two netted out in the aggregate. The decision to use "correct address" matching was not lightly taken. Indeed, some earlier tests used "any address" matching, i.e., attempting to search all reported addresses. Either approach has advantages and disadvantages.

The second concept was that of the search area. If a person reported that he lived at a given address, then the matching classified him as correctly enumerated if he was counted anywhere in the block. It also classified him as correctly enumerated if he was counted in a surrounding block. There was a limit to how far the matching process could search. If a census computer operation coded the address across town, for example NW vs. SE, the matching did not search there and did not find the person. The matching counted him/her as missed. To balance, the system had to count the other enumeration as erroneous, because it was outside the defined search area.

A final concept was the idea of "sufficient information for matching." When a match was found, it was easy to say that the case was enumerated. When no match was found, it did not necessarily prove that the person was not enumerated, but merely that the search had not been conducted in the correct place. A further review of the case might have shown that there was "insufficient information," leading to its being classified as "unresolved." Rules that classify cases as "sufficient information for matching" were applied before the matching begins. These rules were designed so that for matches there was confidence that the person was correctly enumerated and, equally important, for non-matches, there was confidence that the person was omitted. This approach leads to a somewhat higher "unresolved" rate, but presumably to more accurate overall results.

The accuracy and consistency of the matching process were central to the PES process. Too many matches would have decreased the estimate of population, too few would have increased it. Matching errors would have distorted the

estimated population distribution if they differed by post-strata. The rules were developed over a decade of research. The multiple levels of matching were designed to ensure that the rules were applied consistently between clerks and between offices.

The E-sample, those persons in the PES blocks who were enumerated in the census, was examined to determine if they were correctly enumerated. E-sample persons were matched back into the census to determine if they were enumerated more than once (duplicates). E-sample persons who were matched to the P-sample were assumed to be correctly enumerated (except for duplicate census enumerations). The remaining E-sample persons who were not matched to the P-sample were potential candidates for erroneous enumerations. These unmatched census persons were also included in the PES follow-up operation described above. The follow-up interviewers determined the enumeration status of those persons; that is, if they were correctly enumerated and simply not in the P-sample or if they were erroneously enumerated.

Errors in measuring census erroneous enumerations have almost as much effect on the final estimate of net undercount as errors in measuring census omissions. Reinterview and rematch studies were used to measure the error that the PES makes in measuring census erroneous enumerations and the effects of these errors on the PES estimates.

In processing the E-sample, it was important to include all census enumerations, especially those conducted long after April 1. Common sense and the results from 1980 both indicated that these were more likely to be erroneous

than those done on or near April 1. Because of this, there was a special operation to process census enumerations that were enumerated late in the census process. This operation presented special challenges in merging the data with the results of the earlier operation and completing the processing in time.

A final matching and reconciliation operation took place at the conclusion of the PES follow-up. This included the fourth stage of clerical matching for the P-sample and a determination of whether persons in the E-sample were correctly or erroneously enumerated. An important aspect of this operation was that situations arose where correct match status for persons in the P-sample, or correct enumeration status for persons in the E-sample, could not be determined. This situation occurred because the initial interview was inconclusive or because an incomplete interview was obtained during the follow-up.

Imputation and Dual System Estimation

A final PES file was created that reflected the results of the operations described above. This file included the characteristics of each person in the P-sample and the E-sample. The file also included the match status for persons in the P-sample and the enumeration status (correct or erroneous) for persons in the E-sample. As the final file was prepared, computer editing or imputation was performed to correct, insofar as possible, for missing or contradictory data. A critical aspect of imputation involved the estimation of a final match status for those persons whose match status could not otherwise be resolved. The estimation of match status was very critical. For example, mistakes in the PES matching process, which incorrectly identified persons as not

counted in the census (nonmatches), erroneously overstated the estimated undercount and vice versa.

The data in the final PES file were then summarized and incorporated with data from the full census to produce dual system (PES and census) estimates (DSE's) of total population. The DSE's were produced for unique estimation strata (or groupings of persons described below). The dual system estimator is explained more fully in Hogan's document cited above. Essentially it involves estimating how many people were (1) in the PES and in the census, (2) in the PES and out of the census, (3) in the census but not in the PES, and (4) in neither the census nor PES.

The dual system model conceptualized each person as either in or not in the census enumeration, as well as either in or not in the PES. Each person was classified according to the following tableau where the subscripts denote row and column and the stars indicate summing over the entire row/column. N^{**} denotes the entire population.

Enumeration

PES	Total	In	Out
Total	N_{**} . .	N_{*1} . .	N_{*2}
In	N_{1*} . .	N_{11} . .	N_{12}
Out	N_{2*} . .	N_{21} . .	N_{22}

All cells were conceptually observable except for N_{22}, and of course any of the marginal totals that include N_{22}. The cell N_{22} (often called the 4th cell) was an estimate of people missed in both the census and the PES. Even though not directly observable, the DSE of total population included

an estimate of people in the 4th cell. The DSE of total population was based on several assumptions. If the PES was an (approximately) unbiased sample of the whole population, then an (approximately) unbiased estimate of $N_{..}$ could be made by noting that the ratio of those in the PES and in the census to the total in the PES should have been the same as the ratio of the total in the census to the total population. Algebraically:

$$N_{11}/N_{1\cdot}=N_{\cdot 1}/N_{..}$$

Then solve for the total population:

$$N_{..}=(N_{\cdot 1}\cdot N_{1\cdot})/N_{11}$$

This is the dual system estimator of total population.

DSE's were prepared in each of 1,392 post-strata (see next section for a description). Knowing the undercount or overcount rate for each of the groups was important for estimating the net undercount at the local level. It was acceptable for both the PES and the census to have different coverage rates for different post-strata. However, if within a post-stratum, there were sub-groups where both the PES and the census had significantly lower coverage, then the DSE would have been biased.

Another type of bias would have arisen if being enumerated in the census affected the person's response to the PES, or being in the PES affected the person's response to the census enumeration. This would be the case if the PES interviewer and the enumerator compared notes, or if a person refused to cooperate in the census because he had been recently interviewed in PES. The design sought to

minimize this effect by conducting the PES after most of the census operations were completed and by conducting the PES out of the Regional Census Centers rather than out of the local District Offices that conducted the enumeration.

Post-Strata

Using the match status and key data, such as age, race, and sex for each person in the sample, the Bureau prepared DSE's of the total population for each of 1,392 groupings of people (post-strata). The reason for forming the post-strata was to group persons who had similar chances of being enumerated in the census. The post-strata were defined by census division, geographic subdivisions such as central cities of large metropolitan statistical areas, whether the person was the owner or renter of the housing unit, race, age, and sex. Each person in the PES sample belonged in one of the unique post-strata. A full description of the 1,392 post-strata is shown in attachment 2.

For purposes of illustration, the following are examples of the 1,392 post-strata. One example is a post-stratum which contains Black males, age 20-29, living in rented housing in central cities in the New York primary metropolitan statistical area. A second example is that which contains non-Black non-Hispanic females, age 45-64, living in owned or rented housing in a non-metropolitan place of 10,000 or more population in the Mountain Division. A third example is that which contains Asian males, age 45-64, living in owned or rented housing in metropolitan statistical areas but not in a central city in the Pacific Division. A fourth example is that which contains non-black Hispanic females, age 30-44, living in owned or rented housing in central cities in the Los Angeles-Long Beach primary

metropolitan statistical area or other central cities in metropolitan statistical areas in the Pacific Region. As can be seen from these examples, the 1,392 post-strata are very specific.

The Decision on Combining PES and DA Results Before Computing Adjustment Factors

It was expected that the estimate of total population from the PES would be lower than the estimate of total population from DA. That is because there is a tendency for some people to be missed in both the census and the PES. (often referred to as correlation bias.) No such bias exists with DA estimates. For that reason, there was an open decision point about whether or not to "rake" PES estimates to DA estimates before producing adjustment factors.

After examining the information, the Census Bureau decided against trying to combine the results of DA and PES. There were several reasons for the decision. Some of the main ones include:

- The PES estimate of total population was higher than the DA estimate.

- The PES estimate of females was considerably higher than the DA estimate.

- At the point in time the decision had to be made, the DA estimates were preliminary. There was concern that DA estimates might change considerably over time.

• A concern about the quality of certain components of the DA estimates; - for example, the estimate of undocumented immigrants.

• The uncertainty about how combining DA estimates might effect the assumptions underlying the DSE system.

Adjustment Factors

The next step in the post-enumeration survey process was to compare the estimated total population for each post-stratum (the dual system estimate or DSE) to the census count to determine a "raw" adjustment factor. For example, if the DSE for a particular post-stratum was 1,050,000 and the census count was 1,000,000, then the adjustment factor was 1.05, reflecting about a 5-percent estimated net undercount of variability. An adjustment factor may be less than one, thus lowering the census count in a post-stratum if an adjustment is applied. This results when there is evidence of an overcount in the post-stratum.

"Smoothing" the Adjustment Factors

The next steps were "smoothing" the variances of these "raw" adjustment factors, "smoothing" the "raw" adjustment factors themselves to reduce sampling variance associated with them, and the production of final adjustment factors incorporating both smoothing steps. Because the PES was a sample, it was subject to sampling error. Sampling error is an estimate of the error associated with taking some of the population (a sample) rather than all of the population (a census). Disaggregating 377,000 PES persons to 1,392 post-strata produced some post-strata with small sample sizes, and therefore, high estimates of sampling error. The

process of smoothing the "raw" adjustment factors to create final adjustment factors was a step to minimize the effect of sampling error.

Both "smoothing" steps were based on a multi-variate regression model. The factor smoothing step used observed characteristics that have been known to be correlated with undercount. A regression prediction model "predicted" the adjustment factor for each of the 1,392 post-strata. The final adjustment factor was then a weighted average of the originally observed adjustment factor (called "raw") and the modeled factor (from the regression prediction model.) For a post-stratum with low estimated sampling variance, there was heavy weight on the observed factor; and vice versa. The final adjustment factors by post-stratum are shown in attachment 3.

Small Area Estimation

The final adjustment factors were now ready to be used to produce adjusted counts for every block in the Nation. The PES can only produce "direct" estimates of the total population for relatively large geographic areas (i.e., the 1,392 post-strata). If there is a decision to adjust, however, the adjustment must be applied to each of the Nation's 4 million populated blocks. The Bureau developed a model that takes the adjustment factors produced for each of the 1,392 post-strata areas and uses them to estimate adjustment counts for each block. Since each of the post-strata crosses many blocks, the Bureau based its model on a critical assumption that coverage error is similar for all blocks that a post-stratum crosses.

Here are two examples of how block counts could be changed during this process. Suppose a census block with 200 people had 50 people who fell into a particular post-stratum. An adjustment factor of 1.05 was computed for that post-stratum, so 50 was multiplied 1.05, which comes to 52.5. Since procedures allowed adding only whole persons to a block, either 2 or 3 persons were added, based on a pre-specified procedure, to the persons in that post-stratum for that block. Other groupings of persons in the block in this example also were multiplied by the adjustment factor for the post-stratum into which they fell. Similarly, suppose there were 80 people in another post-stratum in a particular census block, and the adjustment factor was 0.94, indicating an overcount. 80 was multiplied by 0.94, which came to 75.2, so 4 or 5 person records were eliminated from that block.

The Bureau then produced a data file that included enumerated people plus people added (or subtracted) by adjustment. It did this by adding or subtracting "adjustment" persons with characteristics that were imputed from other persons in the same block. The "adjusted" data files could then be used to produce all required census tabulations.

The 1990 Post Enumeration Survey Evaluation Program

The Post Enumeration Survey (PES) was conducted to evaluate the coverage of the 1990 Decennial Census. Twenty evaluation projects were subsequently conducted to evaluate the PES.[2] This report briefly describes the

---

[2]In this document, studies P-13 and P-14 are discussed as one study each, although each had two parts. Elsewhere, these parts may be discussed separately, which leads to a total of twenty-two studies.

objectives and implementation of these twenty PES evaluation projects.

Ten of the sources of potential error in the PES were addressed by the evaluation studies:

1. Missing Data.

2. Quality of the Reported Census Day Address.

3. Fabrication in the P-sample.

4. Matching Error.

5. Measurement of Erroneous Enumerations.

6. Balancing the Estimates of Gross Overcount and Gross Undercount.

7. Correlation Bias.

8. Small Area Estimation.

9. Late Census Data.

10. Total Error.

Each of these ten potential sources of error are herein described along with the specific PES Evaluation project used to evaluate or estimate that error.

More detailed project descriptions are found in the Project Plans dated July 31, 1990. For more detailed descriptions of the implementation and results of these

projects, see the final reports of July, 1991, whose executive summaries can be found in Appendix 3.

1. Missing Data

Both the P- and E-samples contain missing data on enumeration status. The E-sample has cases where the information required to determine whether the person is correctly or erroneously enumerated in the census is not available. The P-sample has cases where the information needed to determine whether the person is enumerated in the census is not available.

Missing data occur in more than one way. The interviewer may be unable to obtain an interview during the P-sample interview or during the PES follow-up. A P- or E-sample questionnaire may not have all the demographic and housing information to establish correct enumeration status. Finally, even with all the information requested on the questionnaires, circumstances may be so unclear that the enumeration status cannot be resolved or determined.

Missing data on enumeration status were handled in the production PES in three ways: noninterviews to the P-sample interview were handled by a weight adjustment; missing demographic characteristics in the P- and E-samples (such as age or race) were imputed by means of a hot-deck procedure; and unresolved match status cases were handled by a logistic regression technique.

Missing data can affect the estimates of undercount in a number of ways. For example, if the number of imputed correct enumerations is too high, the undercount estimate will be biased upward, or if the number of imputed

matches in the P-sample is too high, the undercount estimate is biased downward.

Project P1: Analysis of Reasonable Alternatives

The analysis was based on applying alternative missing data treatments, such as methods of handling proxy interviews and mover data, applying bootstrap samples and applying other logistic regression methodologies to study the sensitivity of the dual system estimate to the method of imputation of missing data. A narrow range of alternative estimates indicates robustness in the dual system estimates, indicating little uncertainty in the estimates due to missing data.

The following were the principal alternate imputation treatments:

P-sample Proxy Alternative: P-sample follow-up interviews marked as proxies (i.e. completed with nonhousehold member) were recoded to indicate that no interview was obtained during follow-up.

E-sample Proxy Alternative: E-sample follow-up interviews marked as proxies (i.e. completed with nonhousehold member) were recoded to indicate that no interview was obtained during follow-up.

P-sample Mover Alternative: Unresolved P-sample movers were imputed as if they were nonmovers.

1988 Style Logistic Regression Alternative: The 1990 production imputation model is quite different than the model that was used in the 1988 Dress Rehearsal. The 1988

Style Logistic Regression Model consists of several standard logistic regression models as in 1988.

Bootstrap Samples: Three E-sample and three P-sample bootstrap samples were drawn in order to measure the variation in the production dual system estimates given the PES sample of blocks. Each bootstrap consisted of selecting households with replacement within blocks.

Imputation Treatment Combinations: Dual system estimates were computed for imputation treatment combinations. The following treatment combinations were used:

P-sample Proxy and E-sample Proxy

P-sample Proxy and 1988 Style Model

E-sample Proxy and 1988 Style Model

P-sample Proxy, E-sample Proxy, and 1988 Style Model

Project P2: Distribution of Missing Data Rates

This study was based on analysis of the missing data rates observed for the P- and E-samples. The types of missing data of greatest interest are noninterviews for the initial PES interview, and unresolved cases which remain after the PES follow-up.

The objectives of PES evaluation project P2 are to determine the level and distribution of missing data by demographic and geographic breaks and to compare the

distributions with the distribution of census undercount (overcount). Hence, the following estimates are examined for P2.

1. Outcome of Interview (PES, PES Follow-up, and PES Evaluations).

2. Proxy Rates (PES, PES Follow-up, and PES Evaluations).

3. Percentage of Item Imputation (Hot-Deck and Logistic Regression).

4. Correlation Between Item Imputation and Census Undercount.

Project P3: Evaluation of Imputation Methodology for Unresolved Match Status Cases

This study was based on a reinterview of a sample of the P- and E-sample cases that were unresolved after the completion of the PES production follow-up. The reinterview also included a sample of the initial PES incomplete interviews. The reinterview was conducted immediately following the final PES matching operation. The reinterview used a probing questionnaire and better quality interviewers. In addition, the reinterview procedure allowed greater opportunity to contact knowledgeable respondents.

The objectives of PES evaluation project P3 are to: (1) provide quantitative information on the effect of the match/enumeration status imputation procedures; (2) examine quantitative measures of the effect of the noninterview

adjustment; and (3) examine the characteristics of the household noninterviews. Hence, the following aspects of the PES are evaluated in P3.

1. Match/Enumeration Status Imputation.

2. Converted PES Noninterview Households.

3. PES Noninterview Household Characteristics.

2. Quality of the Reported Census Day Address

Dual system estimation assumes that P-sample respondents can be linked, or matched, correctly to their census day address. This evaluation measures address reporting and the error in the number of people matching a census enumeration due to address reporting error. Census Day was on April 1, 1990. The PES was conducted in July and August, 1990. Thus, some of the respondents had moved between the time the census was conducted and the PES was in the field. However, in spite of probes on the PES interview questionnaire, respondents may fail to report that they moved. This type of error may cause the matching operation to search the census in an area other than where the respondent was enumerated and to assign a nonmatch status to respondents who might have been enumerated.

Project P4: Quality of the Reported Census Day Address--Evaluation Follow-up

An additional reinterview of a sample of P-Sample cases from the production follow-up was conducted. The sample consisted of nonmatches and unresolved P-sample cases in the PES block clusters selected for the evaluation

follow-up. Some matches from whole household matched households were subsampled within each cluster. In addition, matches were selected from partially matched households. A specially designed questionnaire with special probes was used by highly skilled enumerators (Census Bureau Field Representatives). The reinterview allowed greater opportunity to contact designated respondents and probe more deeply for census day accuracy of the PES process for identifying movers and the quality of mover address reporting. Therefore, reviewing these results allowed an assessment of the accuracy of the census day address reported in the production PES.

This evaluation is based on a follow-up and reinterview operation that took place immediately following the final PES matching operation. The follow-up operation consisted of a sample of P-sample matched and nonmatched persons who were excluded from the production follow-up. A review of the results of this follow-up addressed the questions concerning the assumptions underlying the rules that were used in determining which cases should be sent for the production follow-up. This operation was done after PES production matching had been concluded.

3. Fabrication in the P-Sample

Interviewers, for whatever reason, may fabricate persons within enumerated housing units. The PES program had an extensive quality control (QC) program that identified and corrected fabrications. However, even with the best of intentions fabrications potentially remain after this operation. Three studies were implemented to address the effect of any uncorrected fabrications that remained in the data set after the quality control operation. The first study (P5a) identifies

the residual fabrication by means of the evaluation follow-up and revisit interviews; subsequent matching of these households will identify fabrications. The second study (P5) utilizes the PES field operation quality control records to estimate "upper bound" residual PES fabrications. The third study (P6) provides model-based estimates of fabrications by comparing, at the block level, interviewer nonmatch rates with "nearby" interviewer nonmatch rates. These comparisons provide an indication of the quality of the interviewers work.

Project P5a: Analysis of P-Sample Fabrication From Evaluation Follow-up Data

The evaluation follow-up described for Project P-4, provided estimates of P-sample fabricated persons. These estimated fabrications can be used as independent estimates (from the quality control) of the level of fabrications in the P-sample. In addition, the quality control operations for the PES interviewing were assessed by comparing the estimated residual error rate from quality control records with the estimated fabrication rate from the follow-up.

Project P5: Analysis of PES P-Sample Fabrications From PES Quality Control Data

The data for project P5 comes from the Quality Control operation of the PES interviewing phase. The purpose of the QC check is to confirm that the PES interviewer visited the correct housing unit and conducted the interview according to the survey procedures. The roster of names, ages and census day addresses are all verified during the interview for the QC sample. A P-sample questionnaire fails the QC check when the household roster

is incorrect. When an error is detected, all the recent work of the production interviewer undergoes a QC reinterview. Fabricated households discovered as a result of the QC reinterview are not used and correct interviews are obtained. Overall, approximately 35 percent of the P-sample (i.e., 56,000 households) were reinterviewed in the QC operation of the PES interviewing phase through telephone calls and personal visits.

The central problem or assumption of investigation for project P5 is the estimation of the amount of residual (i.e., undetected) fabrication that exists in the P-sample after the QC operation has been concluded. This analysis provides estimates both in terms of households and persons within these households.

Project P6: Fabrication in the P-Sample: Interviewer Effect

The objective of P6 was to gain knowledge about possible undetected fabrication in the PES. Though it is expected that curbstoners make up only a fraction of the PES work force and the quality control detects and eliminates such curbstoning, the potential impact of undetected fabricated data can be serious. This type of error inflates the undercount estimate. In addition, the inflated nonmatch rates are likely differential, i.e., larger for some post-strata than others.

The purpose of this study was to evaluate the quality control procedure implemented in PES to see how effective it was in detecting fabrication. This was done by developing a model to predict the nonmatch rate from the actual nonmatch rate obtained by interviewers working in areas with households of similar demographic characteristics. The

assumption underlying the model was the interviewers working in similar areas would have similar nonmatch rates and the deviations from the model would indicate undetected curbstoning. Standardized scores (Z-scores) were computed for each interviewer rather than comparing the absolute differences between the observed and the expected rates. This was done to take into account the size of an interviewer's assignment. Interviewers with large scores differed greatly from the model predication, and were identified as potential curbstoners or poor quality workers. These enumerators were further studied to determine where they had worked and whether they had been detected by the PES QC operation.

4. Matching Error

Errors can occur in the operation where P-sample persons are matched to the original census enumerations. This matching operation was conducted in seven processing offices (PO's). Even though great efforts were made to standardize this operation across all PO's, errors could be relatively concentrated. Two studies were conducted to examine this type of error. The first study (P7) utilized a team of professionals to dependently rematch a subsample of PES block clusters; this operation is referred to as the Matching Error Study. The rematchers had access to the match codes assigned by the PES production matchers, and worked on assignments in PO's other than their home PO where they worked on PES production. The rematch was designed to estimate the net error rate in the assignment of enumeration status in the P-sample and the E-sample. The second study (P5) examined PES production quality control records. This analysis provides insight into the nature of

PES production matching error by examining where differences occur within this multi-tiered operation.

Project P7: Estimates of Clerical Matching Error From the Evaluation

This evaluation was based on a rematch of a subsample of the PES blocks by highly skilled personnel. This project also allowed additional field work as required, when additional information was determined to be necessary to resolve specific cases. The assumption underlying the evaluation is that better training and personnel can detect systematic errors in the matching.

The subsample of blocks included in this evaluation was based on a stratified sample designed to give a higher probability of selection to blocks with potential matching problems. In addition, the highly skilled personnel used for this evaluation were assigned to work in different processing offices, to the extent possible, to minimize redoing blocks that they previously processed.

Project P8: Matching Error--Estimates of Clerical Matching Error in the P-Sample From Quality Assurance Results

This evaluation was carried out by comparing the results of the PES matching quality control operation to determine where potential inconsistencies existed.

At the conclusion of the computer matching, the clerical matching proceeds with an initial stage of clerical matching (CMG) followed by a more extensive stage of matching by another group of more qualified special matching group clerks (SMG1). Another special matching

group (SMG2) also conducted matching on the same cases as the CMG and SMG1 stages. Discrepancies between the SMG1 and SMG2 are adjudicated by a higher level PES matching technician.

Comparing the differences between the various stages of matching can identify potential areas where matching error can exist. These findings may be of interest in interpreting the results of project P-7.

5. Measurement of Erroneous Enumerations

Some census enumerations are in fact erroneous. The following enumerations are erroneous:

(1) Duplicated persons.

(2) Fictitious persons.

(3) People who died before Census Day.

(4) People who were born after Census Day.

(5) People enumerated outside the search area where they were living on Census Day.

An estimate of erroneous enumerations is needed for the PES-census dual system estimate of the total population. Three studies investigate errors in classifying the enumeration status (correct or erroneous) of the E-sample persons. The first study (P10) utilized the same team of highly skilled professionals as did project P7 to dependently review the PES E-sample production results in a subsample of PES block clusters. This operation was part of the

Matching Error Study. The focus was on the errors that occurred during PES production processing involving duplicates and fictitious persons; however, there was also an examination for the above (3), (4), and (5) type errors. The second study (P9a) utilized data collected from the evaluation follow-up interviews. The evaluation follow-up questionnaire was administered by more competent interviewers than was used by PES production. Also, this questionnaire had more probes than the standard PES production follow-up questionnaire. An alternative estimate of erroneous enumerations resulted from this operation. The third study (P9) is a consistency check; an examination of PES E-sample cross-tabulations provides evidence as to whether a particular type of error in classifying enumeration status is present in the data.

Project P10: Accurate Measurement of Census Erroneous Enumerations--Clerical Error in Assignment of Census Enumeration Status

This evaluation was conducted as part of the rematch work described for Project P7, Evaluation of Clerical Error in the P-sample matching. The study used the same subsample of PES blocks. The E-sample for these blocks underwent the intensive review by highly skilled matchers. This work was supplemented by the reinterview described for Project P9a. The objective was to determine whether the production matching operations are correctly classifying census erroneous enumerations.

The combination of both of these projects--P7 and P10-is referred to as the Matching Error Study (MES).

Project P9a: Accurate Measurement of Census Erroneous Enumerations--Evaluation Follow-up

A sample of E-sample cases was sent for a PES evaluation field follow-up to determine whether a person was correctly enumerated in the Census. The sample included both E-sample cases where an interview was obtained and those where a follow-up interview was not completed. The follow-up reinterview was conducted with more experienced enumerators using a more probing questionnaire. In addition, the follow-up allows greater opportunity to contact a respondent and obtain a complete interview. This same evaluation follow-up was used as part of Project P7 and Project P4. The completed evaluation follow-up interview was clerically matched back to the census to assess the accuracy of the PES production procedure in classifying a persons enumeration status.

Project P9: Accurate Measurement of Census Erroneous Enumeration--Consistency Checks

This evaluation was based on examining a variety of cross tabulations prepared from the PES E-sample for each evaluation stratum. Data such as the following was cross-tabulated:

(1) Enumeration status (correct enumeration, erroneous enumeration).

(2) Type of respondent (original census residents, current residents, neighbors, other proxies).

(3) Source of census enumeration (mailback, enumerator return).

(4) Age group.

(5) Enumeration status of other household members (whole household erroneously enumerated, partial household erroneously enumerated).

The cross tabulations were examined to assess whether the pattern of erroneous enumerations was consistent with previous experience and research findings. Unexplainable discrepancies in the erroneous enumerations were considered as potential indications that the PES process incorrectly measured erroneous enumerations.

6. Balancing the Estimates of Gross Overcount and Gross Undercount

Because of the limited search area that is used to estimate P-sample nonmatches and E-sample erroneous enumerations, balancing error can occur. There was no plan to obtain a direct estimate of this type of error. The components of balancing error are included in the measures of errors that are produced from other studies such as P-7 and P-10 (matching error studies)

Project 11: Balancing Error Evaluation--Percentage of Matches Found Outside Sample Blocks

This evaluation used supplementary information to assess whether balancing is an issue in the performance of PES. Inconsistencies found are indications of potential failure of balancing and should be indications of which of the evaluation studies should reflect these errors. The P-sample match rates for the PES blocks and surrounding blocks were compared with the rates at which E-sample persons are

found to be in the PES blocks and in the surrounding blocks. These rates should be the about the same. Differences found were evaluated using the results of the evaluation follow-up.

The rate at which movers matched in the blocks to which they were geocoded was also studied. These rates should be consistent with the corresponding rates for the P-sample nonmovers in the same post-strata.

7. Correlation Bias

The dual system estimation used for the PES is based on several independence assumptions. Two that are of particular interest are homogeneity and causality. The homogeneity assumption requires that everyone has the same probability of inclusion in both the P-sample and the census within the same post-stratum. Failure of the homogeneity assumption usually is seen in an understatement of the undercount for a population group (such as Black males). The causality assumption requires that inclusion in the census does not influence inclusion in the P-sample or vice versa.

Two studies were directed at studying the adequacy of the homogeneity assumption. The first study (P13) compares the dual system estimates with demographic analysis to obtain an estimate of correlation bias at the national level. The second study (P17) is qualitative in nature, and compares the PES dual system estimates, the individual P- and E-samples, and demographic analysis to determine if inconsistencies exist that could indicate the presence of correlation bias due to failure of the homogeneity assumption.

The causality assumption is investigated by two qualitative studies (P14 a and b). The first of these studies pairs non-PES blocks with similar PES blocks and compares characteristics. There should be no difference between these blocks except for the random variation introduced by sampling. The second study uses a debriefing of field interviewers to assess the potential for correlation bias.

Project P13: Use of Alternative Dual System Estimators to Measure Correlation Bias

Alternative dual system estimators were developed using information from demographic analysis to try to address the problem of correlation bias due to failure of the homogeneity assumption--when people missed by the census are more likely to be missed by the PES than those included in the census and vice-versa. This was done by using demographic analysis sex ratios (the ratio of males to females) and the PES dual system estimates for females to create an alternative estimate for males. The DSE for females was multiplied by the sex ratio appropriate for each PES age group. By comparing these alternative estimates for males with the PES dual system estimates for males gives an estimate of correlation bias at the national level. The estimated correlation bias was then allocated to the individual PES male post-strata proportional to P-sample non-matches. This permitted estimates of correlation bias to be produced at the individual post-stratum level.

Project P17 Internal Consistency of Estimates

This study has two objectives: (1) to evaluate the reasonableness of the age sex distribution in the census and PES estimates and (2) to compare the PES and demographic

analysis (DA) estimates of undercount to make some assessment of the accuracy of the PES estimates. For these purposes, sex ratios and information on undercount rates from the PES and DA were used. Sex ratio are used to evaluate if overall results on sex distribution are reasonable. Because demographic analysis estimates are available at the national level only, most comparison are limited to analyzing data for the U.S. by race black and non-black.

Project P14 Independence of the Census and P-Sample, Comparison of Blocks

The analysis for this project is directed at assessing the existence of correlation bias due to failure of the causality assumption:

The probability of an individual being included in the P-sample is not altered by inclusion in the census, and the probability of being included in the census is not altered by inclusion in the P-sample.

Several steps were implemented to study the existence of correlation bias. First, a sample of PES blocks paired with comparable non-PES blocks was drawn. The sample was selected by type of enumeration area (TEA) in order to do analyses isolating these groups. Each type of enumeration was analyzed as a separate data set since the timing of the PES and census operations were different across areas. Therefore, any PES effects on the census would be different for each TEA and should be tested using separate data sets.

The difference from PES blocks and non-PES blocks were the focus of the tests. For each block, relevant data

were extracted from the final census files in January, 1991 and aggregated from person records to block level records. The preliminary variables were organized a priori into groups: block size, population coverage, housing unit status, mailback, field response, and edit & quality. The data were tested for relevance, completeness, and redundancy.

8. Small Area Estimation

Project P12: Evaluation of the Synthetic Assumption

Synthetic adjustment is used in the PES to "carry down" the estimated adjustment factors to the census counts in each post stratum. This synthetic adjustment assumes that the probability of being missed by the census is constant for each person within the post-stratum.

The coverage error may vary substantially within the PES strata although the post strata were drawn so as to be homogeneous with respect to expected coverage error. The goal of this study is to verify that the assumption underlying the synthetic adjustment is valid.

The analysis was based on studying the homogeneity of several different block level statistics. Three different types of analysis were conducted. First the distributions of census characteristics thought to be highly correlated with coverage error (e.g., mail return rate) were examined. Secondly, the distribution of the components of coverage error at the block level were studied. These components were erroneous enumeration rates and P-sample nonmatch rates. Finally, the production smoothing model was used to predict a block level adjustment factor for the same sample of blocks used for the first analysis.

The analysis concentrated on determining whether the block level statistics clustered unusually by state within the PES post-strata. Further analysis to examine clustering at other levels such as place and county remains to be carried out.

9. Late Late Census Data

Project P18: Evaluation of Late Late Census Data

Census data capture was completed after the completion of the last planned PES matching operation which was Late Census Data matching. A small amount of changes to census data (census additions, deletions and updated person data) resulted from the late census data capture activities. A portion of these changes were included into the PES results through the Late Late Census Data (LLCD) matching operation. The remainder of these late census data changes were not processed due to time constraints, and were not included in the PES results. The Evaluation of Late Late Census Data (Project 18) examines the effect that the late census data changes not included in the PES have on the PES estimates of undercount. The remaining late-late census data were processed to determine the effect that this would have had on the dual system estimates.

10. Total Error

Project 16: Total Error in PES Estimates for Evaluation Post Strata

The dual system estimator used in the estimation for the PES is known to be subject to various components of nonsampling error, in addition to sampling error. The PES

evaluation program includes studies that provide direct measures of error due to nonsampling and sampling error components. These errors combine in the dual system estimator model to cause differences from population counts that would be attained under an error-free program. The difference between the PES estimate and the error-free count is referred to as the total error.

Project P16 evaluates both the components of error and the total error in the PES estimates for the 13 evaluation post strata. The components of error are response correlation bias (also called model bias), matching error, quality of reported Census Day address, fabrication in the P-sample, processing error in the E-sample, data collection error in the E-sample, error in balancing the estimates of the gross overcount and the gross undercount missing data (imputation error), sampling variance, and ratio estimator bias.

The evaluation of the total error assesses the overall accuracy of the PES estimates of population size and the census undercount rate. A synthesis of the components errors provides estimates of the bias and variance. This analysis then assesses the combined effect of the errors on the PES estimate of the undercount rate. The estimates of the mean and variance of the distributions of the component errors are based on the conclusions drawn from the various evaluation studies. The simulation method produced an estimate of the bias and variance of the estimated undercount rate.

The results of the total error model were also used in a loss function analysis to assess the accuracy of the distributions of population across states, places, and counties

for the adjusted and unadjusted census. This analysis was carried out by forming target populations from the results of the total error work. The biases measured by the PES evaluations were incorporated into PES dual system estimates to produce corrected estimates of the population. These corrected estimates were designated as the target populations. The adjusted and unadjusted census population distributions were compared to the target population distributions using several loss functions. The comparisons were conducted at the state level and at the place and county level for the following size categories:

Places under 25,000 population.

Places of between 25,000 and 50,000 population.

Places of size over 50,000.

Counties under 200,000.

Counties larger than 200,000.

In addition, results were also produced for places and counties over 100,000 population.

Demographic Analysis

The Census Bureau's companion coverage measurement program to the PES was demographic analysis. The demographic coverage estimates could only be used to evaluate the completeness of coverage of the 1990 census at a national level and only for race (Black/Non-Black), sex, and age groups. Demographic analysis could not provide even reasonably reliable coverage estimates for the Hispanic,

Asian/Pacific Islander, or American Indian/Native Alaskan populations because these characteristics have not always been recorded on birth and death certificates; nor can the demographic method provide direct estimates of the resident population at the State or substate level. However, the PES measured under or overcounts of these groups. The demographic coverage estimates were compared to the post-enumeration survey coverage estimates to assess the overall consistency of the two sets of estimates at the national level.

Demographic analysis uses historical data on births, deaths, and legal immigration; estimates of emigration and undocumented immigration; and Medicare data to develop an independent estimate of the resident population on census day. The estimate is compared with the census count to yield a measure of net census coverage and net undercount. The particular procedure that is used to estimate coverage nationally in 1990 for the various demographic subgroups depends primarily on the nature and availability of the required demographic data. Birth and death records are available for the entire United States from 1933 on for developing estimates of population at ages under 57 in 1990. In estimating births for each year, the Bureau added to the number of registered births an estimate of underregistration. Underregistration was estimated based on tests conducted in 1940, 1950, and 1964-1968. If the estimates of underregistration are off, they could have a significant effect on undercount estimates because birth data are by far the largest component in estimating the population through demographic analysis. In fact, in producing the demographic estimates of population for 1990 the Bureau revised the estimates for certain Black birth cohorts to account for biases

that recent research identified in the birth registration test result of 1940.

National birth and death records are not available before 1933, so the Bureau had to find other ways to estimate the population size of these cohorts in 1990 (ages 55 and over were estimated). For the population 65 and over, administrative data on aggregate Medicare enrollments for 1990 (adjusted for underenrollment) are used to estimate population and net coverage. For the Non-black population aged 55 to 64 in 1990, the estimates of population are based primarily on national birth estimates for 1925-1934 developed by Whelpton. For the Black population aged 55 to 64 in 1990, the estimates of population are based on revisions of estimates for the cohort in 1960 developed by Coale and Rives.

In addition to subtracting deaths, the estimates of births described above are augmented to account for change due to immigration, emigration, and net international movement abroad of citizens (including the Armed Forces and Puerto Rican migrants). The various components of net migration vary significantly in their completeness and quality. The United States does not keep emigration records. Therefore, an estimate had to be made of those who have left the country. While the United States does have good records of legal immigration, there is no accurate estimate of illegal immigration--the most elusive demographic component of population change. The Census Bureau has developed a preliminary estimate for undocumented residents in 1990 based on analysis of survey data and administrative records of the Immigration and Naturalization Service (INS). The INS now collects different information than it did prior to 1980. Recent

immigration reform further complicated the effort to estimate legal immigration and undocumented residents. Although the legislative reform allowed many undocumented aliens to receive amnesty, some of these persons may not actually reside in the United States.

It should be noted that before the demographic estimates of population for race groups are compared to the census to calculate the net undercount, the race categories of the census counts must be "modified" so that they are consistent with the race categories of the historical demographic estimates. Specifically, 9.8 million persons in the 1990 census (mostly of Hispanic origin) reported their race in the "Other race-not specified" category, a category not included in the demographic estimates. This modification added 497,000 persons to the census count for Blacks. Also, the age categories of the 1990 census counts have been "modified" so they are consistent with the April 1, 1990 time reference of the demographic estimates.

It is important to emphasize that results of demographic analysis are not exact but are estimates. To a large extent, they were based on assumptions and best professional judgment. As in the PES, the Bureau tried to estimate potential error in the data produced by demographic analysis. To estimate that overall error, the Bureau conducted 11 detailed demographic analysis evaluation studies to find out as much as possible about each possible source of error--the specific projects are identified in Table 1. Based on these studies, the Bureau developed a range of error around the demographic analysis estimates. Since these evaluation projects and the demographic error model represent an evaluation program new for the 1990 census, the assessments of potential error are subject to change and

improvement over time just as the basic demographic estimates of coverage have been.

Table 1.--The Eleven Demographic Analysis Evaluation Projects

D1 ... Error in Birth Underregistration Completeness Estimates.

D2 ... Uncertainty in Estimates of Undocumented Aliens.

D3 ... Uncertainty in Estimated White Births, 1915-1935.

D4 ... Uncertainty in Estimated Black Births, 1915-1935.

D5 ... Robustness of Estimated Number of Emigrants.

D6 ... Robustness of Estimates of the Population 65 and Older.

D7 ... Uncertainty Measures for Other Components.

D8 ... Uncertainty of Models to Translate 1990 Census Concepts into Historical Racial Classifications.

D9 ... Inconsistencies in Race Classifications of the Demographic Estimates and the Census.

D10... Differences Between Preliminary and Final Demographic Estimates.

D11... Total Error in the Demographic Estimates.

Attachment 1

PES Sample Size by State (P-Sample)

State names	Blocks	Clusters	Housing units
Alabama	280	168	4,706
Alaska	27	16	946
Arizona	569	115	5,046
Arkansas	161	77	2,230
California	652	390	13,013
Colorado	401	101	3,290
Connecticut	74	55	1,816
Delaware	19	12	460
District of Columbia	22	18	657
Florida	298	198	5,973
Georgia	189	112	3,320
Hawaii	49	19	599
Idaho	226	51	1,697
Illinois	300	221	7,553
Indiana	149	92	2,540
Iowa	179	86	2,491
Kansas	264	74	2,188

State names	Blocks	Clusters	Housing units
Kentucky	177	107	3,116
Louisiana	165	105	3,481
Maine	216	67	2,292
Maryland	72	56	2,162
Massachusetts	162	107	3,185
Michigan	232	152	4,959
Minnesota	256	99	3,186
Mississippi	179	103	2,696
Missouri	215	116	3,369
Montana	409	46	1,755
Nebraska	140	44	1,257
Nevada	66	27	1,195
New Hampshire . .	118	49	1,987
New Jersey	117	91	2,752
New Mexico	553	68	2,533
New York	520	371	12,210
North Carolina . . .	209	126	3,754
North Dakota	205	19	679
Ohio	216	146	4,491
Oklahoma	271	93	2,737
Oregon	310	83	2,575

State names	Blocks	Clusters	Housing units
Pennsylvania	499	303	9,517
Rhode Island	32	24	832
South Carolina . . .	107	58	1,900
South Dakota	230	18	686
Tennessee	243	173	4,858
Texas	845	436	12,807
Utah	212	40	1,351
Vermont	115	28	1,423
Virginia	144	87	2,609
Washington	352	111	3,939
West Virginia	49	31	911
Wisconsin	141	76	2,264
Wyoming National	488	26	801
Total	12,124	5,290	168,794

Attachment 2

1990 Post-Enumeration Survey Post Strata

The 1990 Post-Enumeration Survey (PES) will provide direct estimates for 1392 post strata. The post strata

are designed to divide the PES sample blocks into groups which have similar characteristics. This helps the Census Bureau to estimate the coverage of the 1990 decennial census more accurately.

The post strata are defined by census division, area (city, non-city, rural, etc.), race, Hispanic origin, tenure group, sex, and age. Tenure refers to whether housing units are owned or rented. Each post strata is given an eight digit code. The attached document shows 116 post strata and the corresponding first six digits of the post stratum code for each. The last two digits are not delineated on the attachment. They define sex and age group. There are six age group classifications. What follows is an explanation of the post strata coding system:

The first digit of each given eight digit code defines the census division. The nine census divisions and the states in each census division are:

1--New England--Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, and Vermont

2--Middle Atlantic--New Jersey, New York, and Pennsylvania

3--South Atlantic--Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, and West Virginia

4--East South Central--Alabama, Kentucky, Mississippi, Tennessee

5--West South Central--Arkansas, Louisiana, Oklahoma, and Texas

6--East North Central--Illinois, Indiana, Michigan, Ohio, and Wisconsin

7--West North Central--Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota

8--Mountain--Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming

9--Pacific--Alaska, California, Hawaii, Oregon, and Washington

Within each census division, the geographic areas are divided by type of area. There are nine possible type of area codes:

0--Central cities in explicitly named PMSAs (see description below)

1--Central cities in large metropolitan areas (Type I MAs)

2--Central cities in small metropolitan areas (Type II MAs)

3--Central cities in a metropolitan area regardless of size

4--Non-central city areas in the New York PMSA

5--Non-central city areas in large metropolitan areas (Type I MAs)

6--Non-central city areas in small metropolitan areas (Type II MAs)

7--Non-central city areas in metropolitan areas

8--Non-metropolitan areas incorporated places with 10,000 + population

9--Balance of non-metropolitan areas

A PMSA is a Primary Metropolitan Statistical Area. There are four explicitly named PMSAs in the 1990 PES post strata. These PMSAs and the census division in which they are located are:

- The New York City PMSA in the Middle Atlantic division,

- The Houston PMSA plus the Dallas PMSA, plus the Fort Worth PMSA in the West South Central division,

- The Chicago PMSA plus the Detroit PMSA in the East North Central division,

- The Los Angeles-Long Beach PMSA in the Pacific division.

A large metropolitan area (type I MA) is an area whose largest central city has a population of at least 250,000 using the 1990 census person count.

A small metropolitan area (type II MA) is an area which does not have any central cities with a population of 250,000 or more.

The balance of non-metropolitan areas consist of areas which are not included in area type number 8. This would consist primarily of rural areas.

Any post strata can include up to three area types. The area types included in a stratum are delineated in the second to fourth digits of the post strata code. For instance, post strata code 578910 includes area types 7, 8, and 9. But most post strata contain only one area type. If a post stratum has only one area type, the second digit of the post stratum code indicates the area type, and the third and fourth digits are zero. In general, each of the second through fourth digits is filled with a zero from the right if a given geographic area of post stratum contains less than three area types.

The race/hispanic origin is determined by the fifth digit of the post stratum code. The tenure group is determined by the sixth digit of the post stratum code. These three attributes are combined in the coding system. The possible race/hispanic origin groups are: Black, Non-Black Hispanic, Asian-Pacific Islander, American Indian, and Other. A post stratum can consist of more than one race/hispanic origin group. This is reflected in the

definitions below. The tenure designation defines whether the persons in the geographic area are owners or renters. Some geographic areas were not divided by tenure. The possible codes for the fifth and sixth digits are:

10--Black (Renter & Owner)
11--Black Renter
12--Black Owner
20--Non-Black Hispanic (Renter & Owner)
21--Non-Black Hispanic Renter
22--Non-Black Hispanic Owner
30--All Other (Renter & Owner)
31--All Other Renter
32--All Other Owner
40--Asian-Pacific Islander (Renter & Owner)
41--Asian-Pacific Islander Renter
42--Asian-Pacific Islander Owner
50--Black and Non-Black Hispanic (Renter & Owner) & Non-Black Non-Asian-Pacific Islander Hispanic
60--American Indian

The seventh digit of the post stratum code defines the sex.

1--Male
2--Female

Within sex there are six age groups, the eighth digit. The age groups are:

1--0-9
2--10-19

3--20-29
4--30-44
5--45-64
6--65+

Attachment 3.--Adjustment Factors by Post Stratum[1]

Stratum code	Factor
09006011	1.166
09006012	1.182
09006013	1.158
09006014	1.197
09006015	1.117
09006016	1.143
09006021	1.130
09006022	1.189
09006023	1.166
09006024	1.071
09006025	1.068
09006026	1.097
13003011	1.001
13003012	0.987
13003013	1.034
13003014	0.984
13003015	0.991
13003016	0.964
13003021	0.989
13003022	0.979
13003023	1.007
13003024	0.976
13003025	0.981
13003026	0.957
13705011	1.068
13705012	1.027
13705013	1.079
13705014	1.068
13705015	1.040

Stratum code	Factor
13705016	1.012
13705021	1.047
13705022	1.008
13705023	1.050
13705024	1.041
13705025	1.012
13705026	1.015
17003011	1.020
17003012	0.989
17003013	1.030
17003014	0.990
17003015	1.014
17003016	0.987
17003021	1.016
17003022	0.974
17003023	1.021
17003024	1.007
17003025	0.994
17003026	0.975
18003011	1.025
18003012	0.980
18003013	1.030
18003014	1.028
18003015	1.011
18003016	0.984
18003021	1.007
18003022	0.974
18003023	1.003
18003024	1.008
18003025	1.002
18003026	0.995
19003011	1.022
19003012	1.008
19003013	1.073

Stratum code	Factor
19003014	1.028
19003015	1.024
19003016	1.013
19003021	1.017
19003022	1.003
19003023	1.018
19003024	1.013
19003025	0.996
19003026	1.006
20001111	1.111
20001112	1.076
20001113	1.122
20001114	1.102
20001115	1.043
20001116	1.077
20001121	1.112
20001122	1.031
20001123	1.090
20001124	1.114
20001125	1.038
20001126	1.050
20001211	1.022
20001212	0.994
20001213	1.010
20001214	0.990
20001215	0.991
20001216	0.980
20001221	1.055
20001222	0.997
20001223	1.019
20001224	0.989
20001225	0.982
20001226	0.981
20002011	1.050

Stratum code	Factor
20002012	0.990
20002013	1.053
20002014	1.018
20002015	1.024
20002016	1.002
20002021	0.995
20002022	1.002
20002023	1.033
20002024	1.015
20002025	1.005
20002026	0.994
20003111	0.993
20003112	0.997
20003113	1.113
20003114	1.041
20003115	1.016
20003116	0.964
20003121	1.001
20003122	0.954
20003123	1.054
20003124	1.011
20003125	0.987
20003126	0.935
20003211	0.988
20003212	0.993
20003213	1.013
20003214	1.001
20003215	1.017
20003216	0.954
20003221	1.030
20003222	0.980
20003223	1.017
20003224	1.012
20003225	0.972

Stratum code	Factor
20003226	1.002
20004011	1.130
20004012	1.124
20004013	1.156
20004014	1.107
20004015	1.104
20004016	1.095
20004021	1.128
20004022	1.069
20004023	1.130
20004024	1.133
20004025	1.101
20004026	1.081
21001111	1.092
21001112	1.037
21001113	1.126
21001114	1.107
21001115	1.063
21001116	1.033
21001121	1.090
21001122	1.076
21001123	1.127
21001124	1.083
21001125	1.055
21001126	1.035
21001211	1.022
21001212	1.040
21001213	1.029
21001214	0.989
21001215	0.992
21001216	0.988
21001221	1.037
21001222	0.984
21001223	1.010

Stratum code	Factor
21001224	0.969
21001225	0.986
21001226	0.989
21003111	1.002
21003112	0.970
21003113	1.034
21003114	1.003
21003115	0.969
21003116	0.984
21003121	0.991
21003122	0.997
21003123	1.001
21003124	1.008
21003125	0.985
21003126	0.959
21003211	1.024
21003212	0.956
21003213	1.013
21003214	1.020
21003215	0.998
21003216	0.982
21003221	1.005
21003222	0.995
21003223	1.049
21003224	0.987
21003225	0.991
21003226	0.979
22001011	1.127
22001012	1.031
22001013	1.129
22001014	1.142
22001015	1.103
22001016	0.057
22001021	1.157

Stratum code	Factor
22001022	1.080
22001023	1.140
22001024	1.071
22001025	1.074
22001026	1.058
22003011	0.991
22003012	0.989
22003013	1.037
22003014	1.022
22003015	1.017
22003016	0.975
22003021	1.008
22003022	0.968
22003023	1.002
22003024	0.993
22003025	1.009
22003026	0.974
23002011	1.010
23002012	1.021
23002013	1.071
23002014	1.022
23002015	1.008
23002016	0.972
23002021	1.024
23002022	0.976
23002023	1.008
23002024	1.055
23002025	1.010
23002026	0.995
24003011	1.053
24003012	0.991
24003013	1.020
24003014	1.012
24003015	0.996

Stratum code	Factor
24003016	0.981
24003021	1.017
24003022	1.006
24003023	1.057
24003024	0.991
24003025	0.979
24003026	0.978
24505011	1.071
24505012	1.057
24505013	1.115
24505014	1.095
24505015	1.060
24505016	1.060
24505021	1.108
24505022	1.032
24505023	1.063
24505024	1.085
24505025	1.057
24505026	1.014
25003011	1.009
25003012	0.983
25003013	1.037
25003014	1.031
25003015	0.981
25003016	0.971
25003021	1.029
25003022	1.018
25003023	1.033
25003024	1.002
25003025	0.983
25003026	0.973
26003011	1.018
26003012	0.990
26003013	1.040

Stratum code	Factor
26003014	0.994
26003015	0.991
26003016	0.984
26003021	1.003
26003022	0.978
26003023	0.999
26003024	1.011
26003025	0.994
26003026	0.984
28003011	1.015
28003012	0.967
28003013	1.017
28003014	1.030
28003015	1.006
28003016	0.991
28003021	1.061
28003022	0.975
28003023	1.016
28003024	0.998
28003025	0.992
28003026	0.984
29003011	1.014
29003012	0.991
29003013	1.042
29003014	1.019
29003015	0.993
29003016	1.001
29003021	1.009
29003022	0.999
29003023	1.041
29003024	1.017
29003025	0.982
29003026	0.986
29995011	1.071

Stratum code	Factor
29995012	1.048
29995013	1.067
29995014	1.074
29995015	1.037
29995016	1.033
29995021	1.055
29995022	1.045
29995023	1.054
29995024	1.068
29995025	1.054
29995026	1.039
31001111	1.133
31001112	1.102
31001113	1.106
31001114	1.131
31001115	1.076
31001116	1.086
31001121	1.155
31001122	1.096
31001123	1.105
31001124	1.069
31001125	1.067
31001126	1.037
31001211	1.066
31001212	1.017
31001213	1.030
31001214	1.024
31001215	0.990
31001216	0.991
31001221	1.037
31001222	1.008
31001223	1.027
31001224	0.992
31001225	0.994

Stratum code	Factor
31001226	0.977
31003111	1.085
31003112	1.038
31003113	1.073
31003114	1.065
31003115	1.047
31003116	0.993
31003121	1.054
31003122	1.055
31003123	1.099
31003124	1.013
31003125	1.011
31003126	0.983
31003211	1.039
31003212	1.035
31003213	1.048
31003214	1.035
31003215	0.983
31003216	0.985
31003221	1.035
31003222	1.031
31003223	1.073
31003224	1.021
31003225	0.979
31003226	1.008
32001011	1.052
32001012	1.035
32001013	1.072
32001014	1.037
32001015	1.015
32001016	1.006
32001021	1.084
32001022	1.028
32001023	1.083

Stratum code	Factor
32001024	1.047
32001025	1.003
32001026	0.981
32003011	1.065
32003012	1.066
32003013	1.080
32003014	1.046
32003015	1.027
32003016	0.986
32003021	1.048
32003022	1.032
32003023	1.039
32003024	1.007
32003025	0.987
32003026	0.998
33002011	1.106
33002012	1.064
33002013	1.101
33002014	1.088
33002015	1.005
33002016	0.985
33002021	1.101
33002022	1.056
33002023	1.091
33002024	1.065
33002025	0.984
33002026	0.984
35001011	1.042
35001012	1.012
35001013	1.034
35001014	1.007
35001015	0.996
35001016	0.990
35001021	1.040

Stratum code	Factor
35001022	1.012
35001023	1.045
35001024	1.017
35001025	1.007
35001026	0.986
35003011	1.030
35003012	0.997
35003013	1.032
35003014	1.008
35003015	0.982
35003016	0.985
35003021	1.036
35003022	1.015
35003023	1.035
35003024	0.995
35003025	0.975
35003026	0.983
36001011	1.074
36001012	1.033
36001013	1.034
36001014	1.044
36001015	1.018
36001016	1.003
36001021	1.035
36001022	1.043
36001023	1.051
36001024	1.042
36001025	1.010
36001026	1.001
36003011	1.052
36003012	1.007
36003013	1.039
36003014	1.042
36003015	0.991

Stratum code	Factor
36003016	0.992
36003021	1.069
36003022	1.062
36003023	1.038
36003024	1.043
36003025	1.028
36003026	0.994
37892011	1.030
37892012	1.083
37892013	1.133
37892014	1.074
37892015	1.007
37892016	1.017
37892021	1.090
37892022	1.021
37892023	1.068
37892024	1.059
37892025	0.994
37892026	0.971
38001011	1.025
38001012	1.001
38001013	1.023
38001014	1.033
38001015	1.023
38001016	0.984
38001021	1.057
38001022	1.015
38001023	1.048
38001024	1.021
38001025	0.953
38001026	0.963
38003011	1.058
38003012	1.015
38003013	1.066

Stratum code	Factor
38003014	1.020
38003015	1.000
38003016	0.981
38003021	1.046
38003022	1.010
38003023	1.026
38003024	1.007
38003025	0.995
38003026	0.979
39001011	1.057
39001012	1.039
39001013	1.021
39001014	1.039
39001015	1.023
39001016	0.981
39001021	1.071
39001022	1.045
39001023	1.045
39001024	0.999
39001025	0.994
39001026	0.979
39003011	1.047
39003012	1.014
39003013	1.063
39003014	1.035
39003015	1.002
39003016	0.994
39003021	1.058
39003022	1.045
39003023	1.060
39003024	1.022
39003025	1.022
39003026	0.997
41003111	1.084

Stratum code	Factor
41003112	1.074
41003113	1.056
41003114	1.078
41003115	1.015
41003116	0.989
41003121	1.075
41003122	1.050
41003123	1.042
41003124	1.062
41003125	1.025
41003126	0.982
41003211	1.045
41003212	1.032
41003213	1.042
41003214	1.043
41003215	1.011
41003216	0.994
41003221	1.065
41003222	1.028
41003223	1.064
41003224	1.038
41003225	1.006
41003226	1.001
42003011	1.075
42003012	1.018
42003013	1.072
42003014	1.042
42003015	1.002
42003016	0.996
42003021	1.036
42003022	1.055
42003023	1.058
42003024	1.020
42003025	0.987

Stratum code	Factor
42003026	0.975
43005011	1.093
43005012	1.075
43005013	1.090
43005014	1.085
43005015	1.055
43005016	1.009
43005021	1.116
43005022	1.041
43005023	1.083
43005024	1.043
43005025	1.003
43005026	0.987
47003011	1.041
47003012	1.023
47003013	1.043
47003014	1.042
47003015	1.002
47003016	0.987
47003021	1.051
47003022	1.024
47003023	1.050
47003024	1.015
47003025	1.007
47003026	0.990
47895011	1.062
47895012	1.008
47895013	1.020
47895014	1.042
47895015	1.004
47895016	0.999
47895021	1.050
47895022	1.011
47895023	1.038

Stratum code	Factor
47895024	1.027
47895025	1.004
47895026	0.975
48003011	1.039
48003012	1.029
48003013	1.053
48003014	1.020
48003015	1.003
48003016	0.996
48003021	1.048
48003022	1.017
48003023	1.032
48003024	1.014
48003025	0.988
48003026	1.004
49003011	1.032
49003012	1.021
49003013	1.066
49003014	1.012
49003015	0.990
49003016	0.998
49003021	1.032
49003022	1.016
49003023	1.060
49003024	1.010
49003025	0.987
49003026	1.010
50001011	1.098
50001012	1.081
50001013	1.096
50001014	1.072
50001015	1.042
50001016	1.020
50001021	1.104

Stratum code	Factor
50001022	1.057
50001023	1.117
50001024	1.058
50001025	1.022
50001026	0.995
50002011	1.088
50002012	1.044
50002013	1.143
50002014	1.063
50002015	1.014
50002016	0.963
50002021	1.128
50002022	1.079
50002023	1.105
50002024	1.043
50002025	0.992
50002026	0.958
50003111	1.058
50003112	1.050
50003113	1.073
50003114	1.060
50003115	1.035
50003116	1.008
50003121	1.080
50003122	1.043
50003123	1.053
50003124	1.019
50003125	1.028
50003126	0.990
50003211	1.033
50003212	1.004
50003213	1.054
50003214	1.020
50003215	1.017

Stratum code	Factor
50003216	0.977
50003221	1.033
50003222	1.019
50003223	1.027
50003224	1.025
50003225	0.997
50003226	0.999
51003111	1.041
51003112	1.038
51003113	1.027
51003114	1.032
51003115	1.014
51003116	0.982
51003121	1.059
51003122	1.039
51003123	1.069
51003124	1.028
51003125	0.999
51003126	0.980
51003211	1.032
51003212	1.014
51003213	1.039
51003214	1.012
51003215	0.994
51003216	0.984
51003221	1.027
51003222	1.011
51003223	1.041
51003224	1.005
51003225	0.994
51003226	0.985
52003011	1.053
52003012	1.034
52003013	1.056

Stratum code	Factor
52003014	1.038
52003015	1.003
52003016	0.995
52003021	1.045
52003022	1.017
52003023	1.053
52003024	1.027
52003025	0.994
52003026	0.988
53001011	1.079
53001012	1.034
53001013	1.099
53001014	1.057
53001015	1.032
53001016	1.001
53001021	1.089
53001022	1.047
53001023	1.074
53001024	1.045
53001025	0.989
53001026	0.997
53002011	1.065
53002012	1.037
53002013	1.051
53002014	1.033
53002015	0.974
53002016	0.970
53002021	1.095
53002022	1.023
53002023	1.094
53002024	1.048
53002025	0.971
53002026	0.979
57003011	1.044

Stratum code	Factor
57003012	1.043
57003013	1.050
57003014	1.024
57003015	0.999
57003016	0.989
57003021	1.033
57003022	1.032
57003023	1.048
57003024	1.030
57003025	0.993
57003026	0.971
57891011	1.069
57891012	1.016
57891013	1.041
57891014	1.033
57891015	1.004
57891016	0.988
57891021	1.032
57891022	1.003
57891023	1.060
57891024	1.013
57891025	0.992
57891026	0.985
57892011	1.056
57892012	1.058
57892013	1.077
57892014	1.065
57892015	1.047
57892016	1.002
57892021	1.081
57892022	1.047
57892023	1.059
57892024	1.043
57892025	1.011

Stratum code	Factor
57892026	1.015
58003011	1.027
58003012	0.994
58003013	1.048
58003014	1.030
58003015	0.999
58003016	0.978
58003021	1.027
58003022	1.021
58003023	1.062
58003024	1.013
58003025	0.993
58003026	0.969
59003011	1.052
59003012	1.032
59003013	1.029
59003014	1.019
59003015	1.014
59003016	0.990
59003021	1.043
59003022	1.016
59003023	1.043
59003024	1.034
59003025	1.006
59003026	0.983
60001111	1.131
60001112	1.031
60001113	1.067
60001114	1.081
60001115	1.042
60001116	0.984
60001121	1.112
60001122	1.061
60001123	1.106

Stratum code	Factor
60001124	1.020
60001125	1.004
60001126	0.954
60001211	1.047
60001212	1.001
60001213	1.042
60001214	1.039
60001215	1.015
60001216	1.029
60001221	1.050
60001222	1.040
60001223	1.033
60001224	1.007
60001225	0.994
60001226	0.975
60003111	1.016
60003112	1.021
60003113	1.087
60003114	1.093
60003115	1.108
60003116	1.028
60003121	1.111
60003122	1.052
60003123	1.123
60003124	0.989
60003125	1.017
60003126	0.924
60003211	1.021
60003212	1.010
60003213	1.001
60003214	1.027
60003215	1.016
60003216	1.005
60003221	1.047

Stratum code	Factor
60003222	1.005
60003223	1.031
60003224	1.000
60003225	1.000
60003226	1.000
60102011	0.958
60102012	1.005
60102013	1.000
60102014	1.026
60102015	0.991
60102016	0.998
60102021	0.993
60102022	0.989
60102023	0.966
60102024	0.957
60102025	0.936
60102026	0.963
61001111	1.042
61001112	1.003
61001113	1.100
61001114	1.052
61001115	1.034
61001116	0.999
61001121	1.086
61001122	1.072
61001123	1.058
61001124	1.047
61001125	0.994
61001126	0.955
61001211	1.091
61001212	0.983
61001213	1.025
61001214	1.026
61001215	1.006

Stratum code	Factor
61001216	1.007
61001221	1.045
61001222	1.014
61001223	1.012
61001224	1.000
61001225	0.949
61001226	0.977
61003111	1.119
61003112	0.954
61003113	0.992
61003114	1.070
61003115	1.033
61003116	0.970
61003121	1.030
61003122	0.980
61003123	1.010
61003124	0.999
61003125	0.940
61003126	0.972
61003211	0.957
61003212	0.971
61003213	1.036
61003214	1.021
61003215	0.973
61003216	0.994
61003221	0.986
61003222	0.989
61003223	1.011
61003224	1.003
61003225	1.016
61003226	1.001
62003011	1.033
62003012	0.978
62003013	1.064

Stratum code	Factor
62003014	1.019
62003015	1.016
62003016	1.020
62003021	1.022
62003022	1.012
62003023	1.032
62003024	1.032
62003025	1.002
62003026	1.008
62705011	1.088
62705012	1.054
62705013	1.090
62705014	1.062
62705015	1.021
62705016	1.006
62705021	1.095
62705022	1.066
62705023	1.074
62705024	1.030
62705025	1.024
62705026	1.002
65003011	1.017
65003012	0.999
65003013	1.030
65003014	1.014
65003015	1.002
65003016	1.003
65003021	1.011
65003022	1.012
65003023	1.008
65003024	0.995
65003025	0.992
65003026	0.997
66003011	1.017

Stratum code	Factor
66003012	0.988
66003013	1.023
66003014	1.034
66003015	0.999
66003016	0.972
66003021	1.013
66003022	1.008
66003023	1.000
66003024	1.018
66003025	0.978
66003026	1.002
68003011	1.005
68003012	0.977
68003013	1.028
68003014	1.008
68003015	1.008
68003016	0.997
68003021	1.003
68003022	1.005
68003023	1.019
68003024	0.997
68003025	0.988
68003026	0.987
69003011	0.991
69003012	0.981
69003013	1.019
69003014	0.987
69003015	0.986
69003016	0.997
69003021	0.984
69003022	0.981
69003023	1.014
69003024	0.982
69003025	0.982

Stratum code	Factor
69003026	0.995
71003111	1.064
71003112	0.995
71003113	1.107
71003114	1.054
71003115	1.041
71003116	0.997
71003121	1.007
71003122	1.015
71003123	1.012
71003124	0.981
71003125	0.996
71003126	0.940
71003211	0.987
71003212	0.980
71003213	1.021
71003214	0.992
71003215	0.996
71003216	0.981
71003221	1.005
71003222	1.026
71003223	1.004
71003224	0.994
71003225	1.000
71003226	0.988
71005011	1.110
71005012	1.030
71005013	1.080
71005014	1.049
71005015	1.037
71005016	1.011
71005021	1.095
71005022	1.072
71005023	1.077

Stratum code	Factor
71005024	1.035
71005025	1.022
71005026	1.009
72003011	1.003
72003012	1.006
72003013	1.060
72003014	1.011
72003015	1.003
72003016	1.010
72003021	1.038
72003022	0.990
72003023	1.067
72003024	1.007
72003025	1.001
72003026	1.014
72505011	1.116
72505012	1.045
72505013	1.101
72505014	1.091
72505015	1.038
72505016	1.021
72505021	1.114
72505022	1.068
72505023	1.084
72505024	1.091
72505025	1.027
72505026	1.023
75003011	1.011
75003012	1.013
75003013	1.028
75003014	1.006
75003015	1.001
75003016	0.999
75003021	1.025

Stratum code	Factor
75003022	0.990
75003023	1.027
75003024	0.993
75003025	1.003
75003026	0.996
76003011	1.030
76003012	0.988
76003013	1.056
76003014	1.022
76003015	1.002
76003016	1.021
76003021	1.023
76003022	1.028
76003023	1.020
76003024	1.007
76003025	1.000
76003026	1.021
78003011	1.003
78003012	0.985
78003013	1.023
78003014	1.025
78003015	1.008
78003016	1.001
78003021	1.041
78003022	0.987
78003023	1.016
78003024	1.016
78003025	0.997
78003026	0.981
79003011	1.013
79003012	0.995
79003013	1.041
79003014	0.999
79003015	0.993

Stratum code	Factor
79003016	1.001
79003021	1.010
79003022	1.000
79003023	1.015
79003024	0.994
79003025	1.001
79003026	0.997
79995011	1.077
79995012	1.007
79995013	1.082
79995014	1.065
79995015	1.033
79995016	1.021
79995021	1.069
79995022	1.026
79995023	1.725
79995024	1.048
79995025	1.027
79995026	0.989
81003111	1.034
81003112	1.035
81003113	1.123
81003114	1.086
81003115	1.041
81003116	0.990
81003121	1.041
81003122	1.061
81003123	1.060
81003124	1.019
81003125	0.977
81003126	1.013
81003211	1.031
81003212	1.021
81003213	1.035

Stratum code	Factor
81003214	1.020
81003215	1.002
81003216	0.986
81003221	1.031
81003222	1.020
81003223	1.045
81003224	1.003
81003225	0.990
81003226	0.980
82003011	1.017
82003012	1.017
82003013	1.071
82003014	1.014
82003015	0.978
82003016	0.975
82003021	1.030
82003022	1.021
82003023	1.064
82003024	0.998
82003025	0.987
82003026	0.982
83005011	1.066
83005012	1.023
83005013	1.107
83005014	1.063
83005015	1.027
83005016	1.005
83005021	1.058
83005022	1.055
83005023	1.077
83005024	1.025
83005025	0.973
83005026	1.004
87003011	1.022

Stratum code	Factor
87003012	1.008
87003013	1.076
87003014	1.023
87003015	0.988
87003016	0.986
87003021	1.026
87003022	0.984
87003023	1.022
87003024	1.000
87003025	0.971
87003026	0.985
88003011	1.021
88003012	1.032
88003013	1.059
88003014	1.026
88003015	0.990
88003016	0.993
88003021	1.036
88003022	1.028
88003023	1.036
88003024	0.996
88003025	0.971
88003026	0.995
89003011	1.050
89003012	1.027
89003013	1.077
89003014	1.036
89003015	1.031
89003016	1.003
89003021	1.046
89003022	1.049
89003023	1.041
89003024	1.024
89003025	1.017

Stratum code	Factor
89003026	1.014
89995011	1.110
89995012	1.076
89995013	1.123
89995014	1.070
89995015	1.039
89995016	1.062
89995021	1.106
89995022	1.084
89995023	1.105
89995024	1.057
89995025	1.076
89995026	1.049
90003111	1.043
90003112	1.076
90003113	1.098
90003114	1.094
90003115	1.004
90003116	0.963
90003121	1.047
90003122	1.056
90003123	1.089
90003124	1.014
90003125	1.015
90003126	0.977
90003211	1.017
90003212	1.043
90003213	1.022
90003214	1.011
90003215	1.000
90003216	1.012
90003221	1.037
90003222	1.041
90003223	1.019

Stratum code	Factor
90003224	1.031
90003225	1.000
90003226	0.995
90301111	1.142
90301112	1.075
90301113	1.115
90301114	1.124
90301115	1.127
90301116	0.971
90301121	1.105
90301122	1.020
90301123	1.089
90301124	1.008
90301125	0.971
90301126	0.960
90301211	1.160
90301212	1.056
90301213	1.128
90301214	1.116
90301215	1.094
90301216	1.013
90301221	1.132
90301222	1.070
90301223	1.108
90301224	1.074
90301225	1.042
90301226	1.054
90302111	1.093
90302112	1.055
90302113	1.159
90302114	1.095
90302115	1.088
90302116	0.992
90302121	1.055

Stratum code	Factor
90302122	1.080
90302123	1.106
90302124	1.035
90302125	1.030
90302126	1.007
90302211	1.052
90302212	1.000
90302213	1.042
90302214	1.004
90302215	0.990
90302216	0.990
90302221	1.029
90302222	1.016
90302223	1.094
90302224	1.025
90302225	0.971
90302226	0.995
90304111	1.047
90304112	1.053
90304113	1.147
90304114	1.090
90304115	1.074
90304116	1.046
90304121	1.069
90304122	1.060
90304123	1.068
90304124	1.074
90304125	0.981
90304126	1.057
90304211	1.076
90304212	1.052
90304213	1.071
90304214	1.065
90304215	1.028

Stratum code	Factor
90304216	1.029
90304221	1.070
90304222	1.072
90304223	1.079
90304224	1.026
90304225	1.033
90304226	1.029
91003111	1.035
91003112	1.045
91003113	1.112
91003114	1.073
91003115	1.020
91003116	0.986
91003121	1.000
91003122	1.033
91003123	1.045
91003124	1.020
91003125	0.947
91003126	0.959
91003211	1.025
91003212	0.978
91003213	1.017
91003214	1.020
91003215	1.004
91003216	0.999
91003221	1.038
91003222	1.030
91003223	1.092
91003224	1.023
91003225	1.001
91003226	0.988
92003011	1.041
92003012	1.005
92003013	1.070

Stratum code	Factor
92003014	1.016
92003015	0.992
92003016	0.983
92003021	0.987
92003022	1.011
92003023	1.028
92003024	1.010
92003025	0.985
92003026	0.973
95003011	1.028
95003012	0.995
95003013	1.050
95003014	0.971
95003015	1.001
95003016	0.979
95003021	1.051
95003022	1.002
95003023	1.029
95003024	0.995
95003025	0.987
95003026	0.967
96003011	1.026
96003012	1.039
96003013	1.014
96003014	1.018
96003015	1.070
96003016	1.002
96003021	1.043
96003022	1.108
96003023	1.065
96003024	1.030
96003025	1.010
96003026	0.976
97001011	1.251

Stratum code	Factor
97001012	1.235
97001013	1.250
97001014	1.278
97001015	1.180
97001016	1.117
97001021	1.199
97001022	1.158
97001023	1.182
97001024	1.136
97001025	1.111
97001026	1.112
97002011	1.092
97002012	1.084
97002013	1.088
97002014	1.085
97002015	1.048
97002016	1.014
97002021	1.088
97002022	1.071
97002023	1.079
97002024	1.052
97002025	1.061
97002026	1.018
97004011	1.026
97004012	0.992
97004013	1.048
97004014	1.009
97004015	0.993
97004016	0.963
97004021	1.063
97004022	0.990
97004023	1.053
97004024	1.011
97004025	0.932

Stratum code	Factor
97004026	0.974
98003011	1.044
98003012	1.027
98003013	1.053
98003014	1.009
98003015	0.996
98003016	0.967
98003021	1.052
98003022	1.024
98003023	1.045
98003024	1.010
98003025	0.994
98003026	1.009
98904011	0.995
98904012	1.008
98904013	1.033
98904014	1.029
98904015	0.985
98904016	0.973
98904021	0.996
98904022	1.013
98904023	1.025
98904024	1.008
98904025	0.985
98904026	0.942
99003011	1.028
99003012	1.036
99003013	1.043
99003014	1.024
99003015	1.005
99003016	0.994
99003021	1.029
99003022	1.020
99003023	1.048

Stratum code	Factor
99003024	1.019
99003025	1.016
99003026	0.996

---

[1] See Attachment 2 for description of post stratum codes.

[FR Doc. 91-17202 Filed 7-16-91; 10:20 am]

UNITED STATES COURT OF APPEALS
FOR THE
SECOND CIRCUIT

93-6183

At a stated term of the United States Court of Appeals for the Second Circuit, held at the United States Courthouse in the City of New York, on the 4 day of January, one thousand nine hundred and ninety-five.

CITY OF NY, STATE OF NY, CITY OF LOS ANGELES, CITY OF CHICAGO, DADE COUNTY, CITY OF HOUSTON, FLORIDA, U.S. CONFERENCE OF MAYORS, NATIONAL LEAGUE OF CITIES, LEAGUE OF UNITED NATION AMERICAN CITIZENS, NATIONAL ASSOCIATION FOR THE ADVANCEMENT OF COLORED PEOPLE, MARCELLA MAXWELL, DONALD H. ELLIOTT, JOHN MACK, OLGA MORALES, TIMOTHY W. WRIGHT, III, RAYMOND G. ROMERO, ANTONIO GONZALES, ATHALIE RANGE, JERRY ALAN WOOD, CAROLYN SUE LOPEZ, CITY OF ATLANTA, GEORGIA, MAYNARD JACKSON, INDIVIDUALLY, AND AS THE MAYOR OF THE CITY OF ATLANTA, FLORIDA HOUSE OF REPRESENTATIVES, FLORIDA STATE CONFERENCE, MIGUEL A. DE GRANDY, WILLYE DENNIS, MARIO DIAZ-BALART, DR. CHARLES EVANS, RODOLFO GARCIA, JR., BOLLOWY L. "BO" JOHNSON, ALFRED J. LAWSON, JR., WILLIS LOGAN, JR., JOHNNIE

MCMILLAN, ALZO J. REDDICK, PETER RUDY WALLACE and T.K. WETHERELL,

Plaintiffs-Appellants,

STATE OF TEXAS, CITY OF PHOENIX, ARIZONA, STATE OF NEW JERSEY, STATE OF FLORIDA, CITY OF CLEVELAND, OHIO, CITY OF DENVER, COLORADO, CITY OF INGLEWOOD, CALIFORNIA, CITY OF NEW ORLEANS, LOUISIANA, CITY OF OAKLAND, CALIFORNIA, CITY OF PASADENA, CALIFORNIA, CITY OF PHILADELPHIA, PENNSYLVANIA, CITY OF SAN ANTONIO, TEXAS, CITY OF SAN FRANCISCO, CALIFORNIA, BROWARD COUNTY, FLORIDA, STATE OF ARIZONA, CITY OF BALTIMORE, MARYLAND, CITY OF BOSTON, MASSACHUSETTS, CITY OF LONG BEACH, CALIFORNIA, CITY OF SAN JOSE, CALIFORNIA, LOS ANGELES COUNTY, CALIFORNIA, SAN BERNADINO COUNTY, CALIFORNIA, DISTRICT OF COLUMBIA, NAVAJO NATION, STATE OF NEW MEXICO, CITY OF TUCSON, ARIZONA and COUNCIL OF GREAT CITY SCHOOLS,

Intervenors-Plaintiffs-Appellants,

PEOPLE OF THE STATE OF CALIFORNIA EX REEL DANIEL E. LUNGREN,

Plaintiff,

COUNTY OF HUDSON, NEW JERSEY,

Intervenor-Plaintiff,

v.

UNITED STATES DEPARTMENT OF COMMERCE, RONALD H. BROWN, ESQ. AS SECRETARY OF THE UNITED STATES DEPARTMENT OF COMMERCE, MICHAEL R. DARBY, AS UNDER SECRETARY FOR ECONOMIC AFFAIRS OF THE UNITED STATES DEPARTMENT OF COMMERCE, BUREAU OF CENSUS, BARBARA EVERITT BRYANT, AS DIRECTOR OF THE BUREAU OF CENSUS, WILLIAM J. CLINTON, AS PRESIDENT OF THE UNITED STATES, DONALD K. ANDERSON, AS CLERK OF THE UNITED STATES HOUSE OF REPRESENTATIVES, MICHAEL ESPY, AS SECRETARY OF AGRICULTURE, DONNA E. SHALALA, AS SECRETARY OF HOUSING & URBAN DEVELOPMENT, ROBERT B. REICH, AS SECRETARY OF LABOR, FREDERICO PENA, AS SECRETARY OF TRANSPORTATION and RICHARD W. RILEY, AS SECRETARY OF EDUCATION,

Defendants-Appellees,

STATE OF WISCONSIN and STATE OF OKLAHOMA,

Intervenors-Defendants-Appellees.

A petition for rehearing containing a suggestion that the action be heard in banc having been filed herein by Appellant STATE OF WISCONSIN

Upon consideration by the panel that decided the appeal, it is

Ordered that said petition for rehearing is DENIED.

It is further noted that the suggestion for rehearing in banc has been transmitted to the judges of the court in regular active service and to any other judge that heard the appeal and that no such judge has requested that a vote be taken thereon.

SO ORDERED:

FOR THE COURT.
GEORGE LANGE III. Clerk
By: /s/
Kathy Brouwer, Operations Mgr.

UNITED STATES COURT OF APPEALS
FOR THE
SECOND CIRCUIT

93-6183

At a stated term of the United States Court of Appeals for the Second Circuit, held at the United States Courthouse in the City of New York, on the 12th day of December, one thousand nine hundred and ninety-four.

CITY OF NY, STATE OF NY, CITY OF LOS ANGELES, CITY OF CHICAGO, DADE COUNTY, CITY OF HOUSTON, FLORIDA, U.S. CONFERENCE OF MAYORS, NATIONAL LEAGUE OF CITIES, LEAGUE OF UNITED NATION AMERICAN CITIZENS, NATIONAL ASSOCIATION FOR THE ADVANCEMENT OF COLORED PEOPLE, MARCELLA MAXWELL, DONALD H. ELLIOTT, JOHN MACK, OLGA MORALES, TIMOTHY W. WRIGHT, III, RAYMOND G. ROMERO, ANTONIO GONZALES, ATHALIE RANGE, JERRY ALAN WOOD, CAROLYN SUE LOPEZ, CITY OF ATLANTA, GEORGIA, MAYNARD JACKSON, INDIVIDUALLY, AND AS THE MAYOR OF THE CITY OF ATLANTA, FLORIDA HOUSE OF REPRESENTATIVES, FLORIDA STATE CONFERENCE, MIGUEL A. DE GRANDY, WILLYE DENNIS, MARIO DIAZ-BALART, DR. CHARLES EVANS, RODOLFO GARCIA, JR., BOLLOWY L. "BO" JOHNSON, ALFRED J. LAWSON, JR., WILLIS LOGAN, JR., JOHNNIE

MCMILLAN, ALZO J. REDDICK, PETER RUDY WALLACE and T.K. WETHERELL,

Plaintiffs-Appellants,

STATE OF TEXAS, CITY OF PHOENIX, ARIZONA, STATE OF NEW JERSEY, STATE OF FLORIDA, CITY OF CLEVELAND, OHIO, CITY OF DENVER, COLORADO, CITY OF INGLEWOOD, CALIFORNIA, CITY OF NEW ORLEANS, LOUISIANA, CITY OF OAKLAND, CALIFORNIA, CITY OF PASADENA, CALIFORNIA, CITY OF PHILADELPHIA, PENNSYLVANIA, CITY OF SAN ANTONIO, TEXAS, CITY OF SAN FRANCISCO, CALIFORNIA, BROWARD COUNTY, FLORIDA, STATE OF ARIZONA, CITY OF BALTIMORE, MARYLAND, CITY OF BOSTON, MASSACHUSETTS, CITY OF LONG BEACH, CALIFORNIA, CITY OF SAN JOSE, CALIFORNIA, LOS ANGELES COUNTY, CALIFORNIA, SAN BERNADINO COUNTY, CALIFORNIA, DISTRICT OF COLUMBIA, NAVAJO NATION, STATE OF NEW MEXICO, CITY OF TUCSON, ARIZONA and COUNCIL OF GREAT CITY SCHOOLS,

Intervenors-Plaintiffs-Appellants,

PEOPLE OF THE STATE OF CALIFORNIA EX REEL DANIEL E. LUNGREN,

Plaintiff,

COUNTY OF HUDSON, NEW JERSEY,

Intervenor-Plaintiff,

v.

UNITED STATES DEPARTMENT OF COMMERCE, RONALD H. BROWN, ESQ. AS SECRETARY OF THE UNITED STATES DEPARTMENT OF COMMERCE, MICHAEL R. DARBY, AS UNDER SECRETARY FOR ECONOMIC AFFAIRS OF THE UNITED STATES DEPARTMENT OF COMMERCE, BUREAU OF CENSUS, BARBARA EVERITT BRYANT, AS DIRECTOR OF THE BUREAU OF CENSUS, WILLIAM J. CLINTON, AS PRESIDENT OF THE UNITED STATES, DONALD K. ANDERSON, AS CLERK OF THE UNITED STATES HOUSE OF REPRESENTATIVES, MICHAEL ESPY, AS SECRETARY OF AGRICULTURE, DONNA E. SHALALA, AS SECRETARY OF HOUSING & URBAN DEVELOPMENT, ROBERT B. REICH, AS SECRETARY OF LABOR, FREDERICO PENA, AS SECRETARY OF TRANSPORTATION and RICHARD W. RILEY, AS SECRETARY OF EDUCATION,

Defendants-Appellees,

STATE OF WISCONSIN and STATE OF OKLAHOMA,

Intervenors-Defendants-Appellees.

A petition for rehearing containing a suggestion that the action be heard in banc having been filed herein by Appellee STATE OF OKLAHOMA on September 21, 1994

Upon consideration by the panel that decided the appeal, it is

Ordered that said petition for rehearing is DENIED.

It is further noted that the suggestion for rehearing in banc has been transmitted to the judges of the court in regular active service and to any other judge that heard the appeal and that no such judge has requested that a vote be taken thereon.

FOR THE COURT,
GEORGE LANGE III, Clerk
By: /s/
Carolyn Clark Campbell
Chief Deputy Clerk